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PROCEEDINGS

OF THE

LITERARY AND PHILOSOPHICAL SOCIETY

OF

LIVERPOOL, *Eng.*—

DURING THE

SIXTY-THIRD SESSION, 1873-74.

No. XXVIII.

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LONDON:
LONGMANS, GREEN, READER, & DYER.

LIVERPOOL:
DAVID MARPLES, LORD STREET.

—
1874.

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1875, May 1,
Ligeia
The Society.

This Volume has been edited by the Honorary Secretary.

The Authors have revised their Papers.

The Authors alone are responsible for facts and opinions.

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CONTENTS.

	PAGE
COUNCIL	vii
LIST OF MEMBERS	viii
HONORARY MEMBERS	xx
CORRESPONDING MEMBERS.....	xxii
ASSOCIATES	xxiii
DONATIONS TO THE LIBRARY	xxiv
LIST OF SOCIETIES, ETC., TO WHICH THIS VOLUME IS PRESENTED	xxvi
BALANCE SHEET	xl
ANNUAL MEETING—REPORT.....	xli
ELECTION OF COUNCIL.	
RE-ELECTION OF ASSOCIATES.	
FIRST ORDINARY MEETING	xliii
Sewage and Non-Sewage—Grown Cabbages, exhibited by Dr. CARTER.	
Objects exhibited by Mr. T. J. MOORE :—	
Euplectella Aspergillum.	
Collection of Corals, Echinoderms, and Sponges, from Port Royal, Jamaica.	
SECOND ORDINARY MEETING	xlv
Nests of the Weaver Bird, from Penang; exhibited by Mr. RICHMOND LEIGH.	

THIRD ORDINARY MEETING

Communication from Mr. ...
tella Aspergillum; exhibited at the First Meeting.

EXTRAORDINARY MEETING xlix

Dr. W. B. CARPENTER, F.R.S., delivered the Second
Roscoe Lecture, on "The Psychology of Belief."

FOURTH ORDINARY MEETING xlix

FIFTH ORDINARY MEETING xlix

Casts of Inscriptions on Relics from Easter Island;
exhibited by the PRESIDENT.

Photographs of North American Scenery, and Notes
thereon; exhibited by Mr. T. HIGGIN.

SIXTH ORDINARY MEETING liii

Notice of Crookes's Experiments on Attraction and
Repulsion, by Mr. A. E. FLETCHER.

Drawing of the Didunculus.

Specimens of Star Fishes from Pisagua, Peru.

Letter from Capt. Mortimer, San Francisco, concerning
some Cephalopods and Algæ.

Specimen of Tobacco Pipe Fish, shown by Mr. T. J.
MOORE.

SEVENTH ORDINARY MEETING..... lv

Dutch Map of the British Isles, 1608; exhibited by
Mr. J. NEWTON.

EIGHTH ORDINARY MEETING lvi

Notice of some Egyptian Bone Dust, by Mr. J. A.
PICTON.

NINTH ORDINARY MEETING..... lvii

Communication by Mr. PICTON on *wich*, *sals*, *hals* and
other suffixes in the names of towns.

TENTH ORDINARY MEETING..... lix

Specimens of the Pen or Style of the Sea Pen.

Astrophyton, or Basket Fish.

CONTENTS.

v.

PAGE

Skull of the Gavial.	
Cast of the Fossil Skull of the Tooth-billed Bird, from the London Clay.	
Living Specimen of the silk-producing Moths, genus <i>Saturina</i> ; exhibited by Mr. T. J. MOORE.	
Japanese Articles, exhibited by Mr. WALTHER.	
EXTRAORDINARY MEETING	lxi
Sir SAMUEL BAKER delivered the Third Roscoe Lecture, on "The Past and Future of the Basin of the Nile."	
ELEVENTH ORDINARY MEETING	lxii
TWELFTH ORDINARY MEETING.	lxii
THIRTEENTH ORDINARY MEETING	lxiii
President's Address on closing the Session.	
Specimens of (supposed) Amber, containing Spiders, from Zanzibar; exhibited by Dr. BAILEY.	

PAPERS READ.

Mr. ALBERT J. MOTT.—"President's Address."	1
Dr. WM. B. CARPENTER, M.D., LL.D., F.R.S.—"On the Psychology of Belief." The Roscoe Lecture for 1878.	45
Mr. EDWARD R. RUSSELL.—"On the <i>Autobiography</i> of John Stuart Mill."	79
Mr. THOMAS J. HUTCHINSON, F.R.G.S., F.R.S.L., M.A.I.—"On some Fallacies about the Incas of Peru."	121
Sir SAMUEL BAKER.—"The Past and Future of the Nile Basin." The Roscoe Lecture for 1874.....	141
Mr. THOMAS WARD.—"The Great European Salt Deposits; with a Theory as to their Origin." With a Map.	168
See also Mr. PICTON's Communication under the Ninth Ordinary Meeting.	
Mr. JOSEPH BOULT, F.R.I.B.A.—"The Danish Intrusion into South Britain."	189

	PAGE
Rev. W. KENNEDY-MOORE.—“The Philosophy of the Fine Arts.”	221
Mr. BARON L. BENAS.—“Semitic Legends.”	249
Mr. ROBERT GORDON.—“Inscription on Burmese Bell, Liverpool Museum.” Translation from the Pali and Burmese.	269
Rev. E. M. GELDART, M.A.—“The Antiquities of Modern Greek.”	275
Mr. C. H. STEARN and Mr. G. H. LEE.—“On the Expansion of the F Line of the Hydrogen Spectrum.” With Plates.....	327

APPENDED.

- Rev. H. H. HIGGINS, M. A. Cantab.—“Synopsis of an Arrangement of Invertebrate Animals in the Free Public Museum of Liverpool; with Introduction.” (Separate pagination.)

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ORDINARY MEMBERS,

ON THE SOCIETY'S ROLL AT THE CLOSE OF THE 68th SESSION,

CORRECTED TO SEPTEMBER, 1874.

Life Members are marked with an Asterisk.

- Oct. 21, 1872 Abbott, Joseph, B.A., *Wavertree Vale, Wavertree-road, and Liverpool College, Shaw-street, Everton.*
- Oct. 11, 1888 Aikin, James, 4, *Gambier-terrace.*
- Nov. 4, 1867 Allen, John Fenwick, *Peasley Vale, St. Helens.*
- March 7, 1864 Archer, F., jun., B.A. Trin. Col., Cantab.,
"Daily Post" Office, Lord-street.
- *Nov. 28, 1858 Archer, T. C., F.R.S.E., F.R.S.S.A., Director of
the Industrial Museum, *Edinburgh.*
- Dec. 14, 1868 Ashe, Theop. Fielding, *Atherton-street, and Moss Bank, Lodge-lane.*
- Feb. 22, 1855 Avison, Thomas, F.S.A., 18, *Cook-street, and Fulwood Park, Aigburth.*
- Jan. 11, 1864 Bagshaw, John, 87, *Church-street, and 26, Bentley-road, Prince's Park.*
- May 4, 1868 Bailey, Fras. J., M.R.C.S., 51, *Grove-street.*
- March 28, 1874 Barclay, W., 5, *Scottish Chambers, 48, Castle-street, and 6, Montpelier-crescent, New Brighton.*
- April 20, 1874 Barton, Rev. John, M.A., *Vicarage, Rainhill.*
- Jan. 18, 1862 Baruchson, Arnold, *Batavia-buildings, Hackinshey, and Blundell Sands, Great Crosby.*
- Nov. 15. 1869 Beer, Joseph B. de (A. Baruchson & Co.), *Batavia-buildings, Hackinshey.*

- March 9, 1857 Bell, Christopher, *Redcross-street*, and 55, *Hamilton-square, Birkenhead*.
- Dec. 10, 1866 Benas, Baron Louis, 5, *South Castle-street*.
- Nov. 14, 1864 Bennett, J. M., *Sir Thomas's-buildings*, and 109, *Shaw-street*.
- Nov. 27, 1865 Biggs, Arthur Worthington, 6, *Liver Chambers*, 9, *Tithebarn-street*, and 106, *Bedford-street*.
- Feb. 6, 1872 Biggs, John H. W., 6, *Windsor-buildings, George-street*.
- Nov. 18, 1867 Biggs, Russell H. W., 28, *Castle-street*, and 24, *Canning-street*.
- Oct. 31, 1859 Birch, Jas. (Messrs. Reiss Brothers), *The Temple, Dale-street*.
- Jan. 25, 1864 Birchall, James, Governor of the Liverpool Industrial Schools, *Kirkdale*, HON. SECRETARY.
- March 9, 1866 Blood, William, *Chamber of Commerce*, and *Greta Mount*, 5, *Woodchurch-road, Birkenhead*.
- Nov. 26, 1866 Boulton, Joseph, 15D, *Exchange-buildings W*.
- *Mar. 6, 1885 Boulton, Swinton, 1, *Dale-street*, and 71, *Bedford-street South*.
- Oct. 19, 1868 Bower, Anthony, *Vauxhall Foundry*, and *Bowersdale, Seaforth*.
- Oct. 21, 1872 Bowring, C. T., *Elmsleigh, Prince's Park*, and 20, *Lancaster Buildings, Tithebarn-street*.
- Dec. 15, 1878 Brass, Joseph, M. D., 6, *Upper Parliament-street*.
- Nov. 4, 1867 Bramwell, Ed., *Cowley Hill, St. Helens*.
- Jan. 27, 1878 Bremner, H. H., 15, *Lord-street*.
- *Jan. 8, 1855 Brockholes, James Fitzherbert, *Claughton Hall, Garstang*.
- Nov. 12, 1866 Browne, Edgar A., 86, *Bedford-street South*.
- Oct. 18, 1869 Brown, Dr. J. Campbell, D.Sc., F.C.S., *School of Medicine, Dover-street*.
- Feb. 4, 1867 Burden, Edward, 128, *Upper Parliament-street*.
- Nov. 12, 1866 Butler, Rev. George, *The College, Shaw-street*.

- April 18, 1864 Burne, Joseph, *Royal Insurance Office, 1, North John-street, and Higher Tranmere.*
- *May 1, 1848 Byerley, Isaac, F.L.S., F.R.C.S., *Victoria-road, Seacombe.*
- Nov. 8, 1862 Cameron, John, M.D., M.R.C.P., Physician to the Southern Hospital, and Lecturer on Medicine at the Royal Infirmary School of Medicine, 17, *Rodney-street.*
- Dec. 2, 1872 Carey, Eustace, *Appleton-in-Widnes, near Warrington.*
- Jan. 9, 1865 Cariss, Astrup, 40, *Castle-street.*
- March 4, 1872 Carter, W., M. B. Lond., 74, *Rodney-street.*
- Dec. 2, 1861 Chadburn, William, 71, *Lord-street.*
- Jan. 26, 1868 Commins, Andrew, LL.D. Dub., *Eldon Chambers, 20, South John-street.*
- Nov. 1, 1869 Cook, C. H., *Blundell Sands.*
- Jan. 12, 1874 Cook, Edmund Alleyne, Ph.D., F.C.S. (Messrs. Crosfield, Barrow & Co.), 828, *Vauxhall Road.*
- Oct. 18, 1869 Cook, Henry James, *Byrom-street, and Burbo House, Blundell Sands.*
- Nov. 4, 1872 Coughtrey, Millen, M.B., Demonstrator of Anatomy Royal Infirmary School of Medicine, *Dover-street and 1, Maryland-street.*
- Oct. 6, 1868 Crosfield, William, Jun., 28, *Temple Court, and Alexandra-drive, Ullet-road.*
- Feb. 6, 1872 Cudlipp, Ralph B., 57, *Catherine-street.*
- Nov. 26, 1866 Curtis, Rev. F. H., M.A. Oxon., *The College, Shaw-street.*
- Feb. 8, 1864 Cuthbert, J. R., 40, *Chapel-street, and White House, Out-lane, Woolton.*
- Dec. 14, 1868 Daly, Denis, 11, *Rumford-street.*
- Jan. 24, 1870 Dallinger, Rev. W. H., F.R.M.S., 4, *Fairholme-road, Great Crosby.*
- Nov. 12, 1866 Davies, E., F.C.S., *The Laboratory, Royal Institution, Colquitt-street.*

- Oct. 21, 1872 Davies, Rev. J. Alden, 6, *Newstead-road, Smith-down-lane.*
- Nov. 2, 1868 Dawbarn, William, *The Temple, Dale-street, and Mossley-hill.*
- Oct. 20, 1878 Day, George, 28, *Brunswick-street, and Abbey Cottage, Aintree.*
- Oct. 1, 1866 Dawson, Thomas, 26, *Rodney-street.*
- Jan. 8, 1872 Deane, Charles Courtenay, 8, *York-buildings, 14, Dale-street, and Blundell Sands.*
- March 9, 1868 Dixon, W., *Somervills House, Poulton-road, Seacombe.*
- April 6, 1874 Dodd, John, *Arvon Chambers, 9, Canning-place, and 2, Derby-terrace, Rock Ferry.*
- Nov. 27, 1868 Dove, John M., *Claughton.*
- Jan. 28, 1848 Drysdale, John James, M.D. Edin., M.R.C.S. Edin., 86, *Rodney-street.*
- Feb. 4, 1856 Duckworth, Henry, F.L.S., F.R.G.S., F.G.S., 82, *Brown's-buildings, Exchange-street W.*
- *Nov. 27, 1848 Edwards, John Baker, Ph. D. Gies., F.C.S., Professor Medical Faculty of Bishop's College, Montreal.
- Mar. 21, 1870 Edwards, Edward E. (Smith, Edwards & Co.), *Adelaide-buildings, 4, Chapel-street.*
- Feb. 24, 1868 Elliot, John, 85, *Peter's-lane.*
- April 7, 1862 English, Charles J., 26, *Chapel-street, and 26, Falkner-square.*
- April 20, 1874 English, Robert A., 26, *Falkner-square.*
- Jan. 12, 1874 Everitt, R., 72, *Chatham-street.*
- *Dec. 18, 1852 Ferguson, William, F.L.S., F.G.S., *Kinmundy House, near Mintlaw, N. B.*
- Feb. 9, 1868 Finlay, William, Senior Mathematical Master, Middle School, *Liverpool College, and 810, Shaw-street.*
- Oct. 1, 1866 Fletcher, Alfred E., F.C.S., H. M. Inspector of Alkali Works, for the Western District, 21, *Overton-street, Edge Hill.*

- Jan. 12, 1874 Frost, John Pownall, 10, *North John-street*.
- *Mar. 19, 1855 Ford, James Thomas, 5, *Essex-st.*, *Temple, E.C.*
- Dec. 2, 1872 Forwood, Wm. Bower (Messrs. Leech, Harrison & Forwood), 16, *Queen's Buildings*, 11, *Dale-street*, and *Burbo Bank Road*, *Blundell Sands*.
- *Feb. 6, 1854 Gee, Robert, M.D. Heidelb., M.R.C.P., Lecturer on Diseases of Children, Royal Infirmary School of Medicine; Physician, Workhouse Hospital, 5, *Abercromby-square*.
- Nov. 8, 1873 Geldart, Rev. E. M., M.A., 8, *Wellfield-place*, *Peel-street*.
- Nov. 8, 1873 Gordon, Robert, Government Engineer, British Burmah, 87, *Gibson-street*, *Liverpool*.
- Nov. 14, 1853 Greenwood, Henry, 32, *Castle-street*, and *Stanley Park*.
- Dec. 15, 1873 Grisewood, William, *Queen-street*, *Liscard*.
- Feb. 9, 1874 Guy, Rev. Robert E., B.A., *St. Anne's*, *Edge Hill*.
- Jan. 22, 1855 Hakes, James, M.R.C.S., Surgeon to the Northern Hospital, 80, *Hope-street*.
- Oct. 21, 1872 Halliwell, Joseph, 10, *College-lane*.
- Oct. 21, 1872 Hanley, John, *Victoria Park*, *Wavertree*.
- *Jan. 21, 1856 Hardman, Lawrence, 85, *Rock Park*, *Rock Ferry*.
- Nov. 15, 1869 Hartwig, Estevan, H. L., 62, *Palmaille*, *Altona*, *Hamburg*.
- Feb. 6, 1865 Hassan, Rev. E., *Alma-terrace*, *Sandown-lane*.
- Oct. 21, 1872 Havelaar, Louis Willem, *Lance-lane*, *Wavertree*.
- Nov. 18, 1865 Hayward, John Williams, M.D., 117, *Grove-street*.
- Feb. 6, 1865 Hebson, Douglas, 18, *Tower Chambers*, and 58, *Bedford-street South*.
- Nov. 4, 1872 Hicks, Sibley, F.R.C.S., 2, *Erskine-street*.
- 18, 1846 Higgins, Rev. H. H., M.A. Cantab., F.C.P.S., *Rainhill*, EX-PRESIDENT.
- 11, 1886 Higginson, Alfred, M.R.C.S., Surgeon Royal Southern Hospital, 44, *Upper Parliament-street*, VICE-PRESIDENT.

- Mar. 22, 1869 Higgin, Thomas, 83, *Tower-buildings*, and *Huyton*.
- Feb. 20, 1871 Highfield, Samuel, *Manor-road*, *Liscard*.
- April 29, 1872 Hiles, Joseph (Gholson, Walker & Co.), *National Bank Buildings*, *Castle-street*, and *Sefton Villas*, *Rice-lane*, *Walton*.
- Nov. 16, 1868 Holden, Adam, 48, *Church-street*, and 2, *Carlton-terrace*, *Milton-road*.
- Oct. 20, 1878 Holland, Edgar S., 70, *Tower-buildings South*, *Water-street*.
- March 9, 1868 Holme, James, 10, *Huskisson-street*.
- *Dec. 14, 1862 Holt, Robert Durning, 6, *India-buildings*, and 29, *Edge-lane*.
- *Nov. 18, 1854 Hunter, John, Member Historic Society, *Pennsylvania*, *Halifax*, *Nova Scotia*.
- Dec. 15, 1878 Hutton, Henry, *Baltic-buildings*, *Redcross-street*.
- Jan. 26, 1857 Hutton, David, 8, *St. George's-crescent*, and 61, *Canning-street*.
- *April 29, 1850 Ihne, William, Ph.D., Bonn, *Villa Felseck*, *Heidelberg*, EX-PRESIDENT.
- Feb. 28, 1857 Imlach, Henry, M.D. Edin., 1, *Abercromby-square*.
- *Oct. 21, 1844 Inman, Thomas, M.D. Lond., M.R.C.P., Consulting Physician, Royal Infirmary, *Vyvanterrace*, *Clifton*, EX-PRESIDENT.
- Nov. 28, 1864 Jeffery, F. J., *Great George-street*.
- Oct. 20, 1878 Johnson, Digby, Royal Insurance Office, *North John-street*.
- Mar. 10, 1862 Johnson, Richard, *Queen-buildings*, and *Blundell Sands*.
- Jan. 26, 1868 Johnson, Richard C., *Queen-buildings*, and *Blundell Sands*, HON. TREASURER.
- Feb. 24, 1868 Jones, Charles W., 3, *Childwall-road*, *Wavertree*.
- Nov. 26, 1866 Jones, Edward, B.A., 85, *Newstead-road*.
- *April 4, 1852 Jones, Morris Charles, F.S.A., F.S.A. Scot., 20, *Abercromby-square*.
- May 5, 1851 Jones, Roger Lyon, *Liverpool and London Chambers*, *Exchange*, and 6, *Sunnyside*, *Prince's Park*.

- Oct. 18, 1869 Jones, Wm. Bolton, 21, *South Castle-street*.
 April 20, 1874 Kearney, Rev. T., 7, *Overbury-street*.
 Oct. 7, 1872 Kelly, Frederick, *Blundell Sands-road East, Great Crosby*.
 Oct. 2, 1865 Kendal, Robinson, 16, *Water-street*, and 178, *Bedford-street*.
 Nov. 12, 1866 Kennedy-Moore, Rev. W., M.A., 151, *Canning-street*.
 Nov. 15, 1869 King, Jos., 18, *Exchange-alley W.*, and *Trelsaren House, Blundell Sands*.
 Nov. 1, 1869 Kinsman, W. N., 8, *Derwent-road, Stoneycroft*.
 Jan. 10, 1848 Lamport, William James, 21, *Water-street*, and *New Brighton*.
 *Jan. 14, 1889 Lassell, William, F.R.SS. L. and E., F.R.A.S., 27, *Milton-street*, and *Wapping*.
 Oct. 21, 1844 Lear, John, 14, *Cook-street*, and *Stoneby Cottage, Stoneby Green, New Brighton*.
 Nov. 8, 1878 Lee, Hamilton (Messrs. Lee & Nightingale), *North John-street*.
 Nov. 8, 1878 Lee, Harold (Messrs. Lee & Nightingale), *North John-street*.
 Dec. 11, 1871 Leigh, Richmond, M.R.C.S.E., 2, *Park-road*.
 Jan. 27, 1878 Levis, Julius, 28, *Grove Park*.
 Nov. 2, 1868 Lloyd, James, Vice-Consul, Argentine Confederation, 16, *Wellfield-place, Peel-street, Prince's Park*.
 April 17, 1865 MacCheane, Wm., M.R.C.S., 47, *Shaw-street*.
 April 20, 1868 Marples, David, *Lord-street* and *Cable-street*, and *Sandon-terrace, 119, Oxton-road, Birkenhead*.
 Nov. 14, 1870 Marples, Joseph, 28, *Leece-street*, and *Fernlee, 51, Whetstone-lane, Tranmere*.
 Nov. 17, 1878 Marples, Josiah, *Melvill Chambers, Lord-street*, and *Broomfield, Egremont*.
 Feb. 9, 1874 Marsden, Peter Crook, *Symefield, Heaton, near Bolton*.
 Feb. 24, 1868 Marsh, John, *Rann Lee, Rainhill*.

- Jan. 21, 1889 Martin, Studley, 27, *Brown's-buildings*, and 177, *Bedford-street South*.
- Nov. 17, 1878 Mellor, James, Jun., *Sefton House*, *Great Crosby*.
- Feb. 20, 1871 Mason, Alfred H., F.O.S., 56, *Hanover-street*, and 811, *Upper Parliament-street*.
- Feb. 5, 1844 Mayer, Joseph, F.S.A., F.R.A.S., F.E.S., *Pennant House*, *Lower Bebington*.
- Oct. 31, 1859 Moore, Thomas John, Corr. Mem. Z.S., Curator Free Public Museum, *William Brown-street*,
VICE-PRESIDENT.
- Nov. 15, 1869 Morgan, Alfred, 126, *London-road*, and 2, *Rathbone-terrace*, *Wellington-road*, *Wavertree*, Hon.
LIBRARIAN.
- Jan. 8, 1855 Morton, George Highfield, F.G.S., 122, *London-road*.
- April 16, 1849 Moss, Rev. John James, B.A., *Upton*, *Cheshire*.
- Oct. 29, 1850 Mott, Albert Julius, 82, *Church-street*, and *Claremont House*, *Seaforth*, PRESIDENT.
- April 8, 1854 Mott, Charles Grey, 27, *Argyle-street*, *Birkenhead*, and *Cavendish-road*, *Birkenhead Park*.
- Nov. 2, 1868 M'Coskry, W., 14, *Cook-street*.
- Mar. 28, 1874 M'Culloch, D. B., 28, *Queen-buildings*, *Dale-street*.
- *Oct. 21, 1867 Muspratt, E. K., *Seaforth Hall*, *Seaforth*.
- Oct. 20, 1865 Nevins, John Birkbeck, M.D. Lond., M.R.C.S., Lecturer on Materia Medica, Royal Infirmary School of Medicine, 8, *Abercromby-square*. Ex-PRESIDENT.
- April 7, 1862 Newlands, A., 8D, *Exchange-buildings*, and 46, *Catherine-street*.
- Feb. 6, 1865 Newton, John, M.R.C.S., 20, *Marmaduke-street*, *Edge Hill*.
- Nov. 2, 1868 Norrie, Rev. B. A. W., M.A. Cantab., *Rainhill*.
- *Oct. 15, 1855 North, Alfred, 28, *Lansdown-crescent*, *Nottinghill*, *London*, W.
- Nov. 18, 1861 Nugent, Rev. James, 1, *Hornby-road*, *Walton*.

- Dec. 10, 1866 Owen, Peter (Farnworth & Jardine), *Liverpool and London-chambers.*
- Feb. 21, 1870 Packer, James Macnamara, M.D., *Rose Cottage, Poplar Bank, Huyton.*
- Nov. 4, 1872 Page, Charles C., 28, *Clarence-street.*
- Dec. 15, 1878 Parnell, E. W., 45, *Huskisson-street.*
- Mar. 8, 1869 Parratt, Thomas P., 8, *Belvidere-road, Prince's Park.*
- Jan. 9, 1871 Patterson, John, 16, *Devonshire-road, Prince's Park.*
- Feb. 20, 1871 Pendlebury, Richard, B.A., *Fellow of St. John's College, Cambridge.*
- Nov. 4, 1861 Philip, Thomas D., 48, *South Castle-street, and Holly Road, Fairfield.*
- Dec. 28, 1846 Picton, James Alanson, F.S.A., Chairman of the Library and Museum Committee, 11, *Dale street, and Sandy Knowe, Wavertree, Ex-PRESIDENT.*
- April 30, 1866 Prag, Rev. Jacob, 85, *Mount-street.*
- Mar. 18, 1872 Pringle, Adam, *Grove Park.*
- Nov. 18, 1871 Proctor, Peter, M.R.C.S., and L.S.A. Lond., 18, *St. James's-road.*
- *Jan. 22, 1866 Raffles, William Winter, 54, *Brown's-buildings, and Sunnyside, Prince's Park.*
- Nov. 12, 1860 Rathbone, Philip H., *Liverpool and London Chambers (H), and Greenbank Cottage, Wavertree.*
- Mar. 24, 1862 Rathbone, Richard Reynolds, 17, *Lancaster-buildings, Tithebarn-street, and Beechwood House, Grassendale.*
- *Jan. 7, 1856 Rawlins, Charles Edward, 12, *Rumford-court, Rumford-place, and Rock Mount, Rainhill.*
- Jan. 9, 1870 Rawlins, Gerald W., *Brook Cottage, Rainhill.*
- *Nov. 17, 1851 Redish, Joseph Carter, 6, *Dingle-lane.*
- Dec. 12, 1870 Rickard, Wm., LL.D., *Alverton House, 86, Upper Parliament-street.*

- Nov. 29, 1869 Roberts, Isaac, F.G.S., 28, *Rock Park, Rock Ferry.*
- Feb. 4, 1867 Robinson, Joseph F., 1, *Knowsley-buildings, Tithe-barn-street.*
- Oct. 4, 1869 Rogers, J. Frederick (Dart & Rogers), *The Temple, Dale-street, and 8, Onslow-road.*
- April 18, 1854 Rowe, James, 16, *South Castle-street, and 105, Shaw-street.*
- Jan. 22, 1872 Russell, Edward R., "*Daily Post*," *Lord-street, and 53, Bedford-street.*
- Feb. 20, 1865 Samuel, Albert H. (Evans, Son and Co., 56, *Hanover-street, and Canning-terrace, Upper Parliament-street.*
- April 7, 1862 Samuel, Harry S., 11, *Orange-court, and 2, Canning-street.*
- Mar. 19, 1866 Sephton, Rev. John, M.A., *Liverpool Institute.*
- Nov. 2, 1868 Sharp, Charles, *Liverpool Institute.*
- Nov. 16, 1868 Sheldon, E. M., M.R.C.S., 228, *Boundary-street.*
- Oct. 29, 1866 Shimmin, Hugh, 56, *Cable-street, and Tue Brook, West Derby.*
- Nov. 7, 1864 Skinner, Thomas, M.D. Edin., *Dunedin House, 64, Upper Parliament-street.*
- Dec. 10, 1866 Smith, Elisha (Henry Nash & Co.), 5, *India-buildings.*
- April 4, 1870 Smith, James, 11, *Lord-street, and Hurst Villa, 15, Bentley-road, Prince's Park.*
- Feb. 28, 1868 Smith, J. Simm, *Royal Insurance Office, North John-street.*
- Feb. 24, 1862 Snape, Joseph, Lecturer on Dental Surgery, *Royal Infirmary School of Medicine, 75, Rodney-street.*
- April 20, 1874 Snow, Rev. T., M.A., 55, *Seel-street.*
- Nov. 3, 1878 Snowden, Christopher, H. M. Customs, *Inland Revenue-buildings.*
- Nov. 12, 1860 Spence, Charles, 4, *Oldhall-street.*
- Feb. 10, 1862 Spence, James, 18, *Brown's-buildings, Exchange, and 10, Abercromby-square.*

- Nov. 27, 1865 Spola, Luigi, LL.D., 85, *Boundary-lane, West Derby-road.*
- Nov. 29, 1869 Statham, H. H., Jun., 5, *Batavia-buildings, Hackins-hey.*
- Jan. 18, 1868 Stearn, C. H., Bank of England, *Castle-street*, and 8, *Eldon-terrace, Rock Ferry.*
- Jan. 9, 1865 Stewart, Robert E., L.D.S., R.C.S., Dental Surgeon, Royal Southern Hospital, and Liverpool Dental Hospital, 87, *Rodney-street.*
- Oct. 18, 1858 Stuart, Richard, 11, *Manchester-buildings*, and *Brooklyn Villa, Breeze Hill, Walton.*
- *Feb. 19, 1865 Taylor, John Stopford, M.D. Aberd., F.R.G.S., 1, *Springfield, St. Ann-street.*
- Jan. 28, 1848 Taylor, Robert Hibbert, M.D. Edin., L.R.C.S. Ed., Lect. on Ophthalmic Medicine, Royal Infirmary School of Medicine, 1, *Percy-street.*
- Nov. 17, 1850 Tinling, Chas., *Victoria-street*, and 29, *Onslow-road, Elm Park.*
- Dec. 1, 1851 Towson, John Thomas, F.R.G.S., Scientific Examiner, Sailors' Home, 47, *Upper Parliament-street.*
- Jan. 7, 1867 Trimble, Robert, *Cuckoo-lane, Little Woolton.*
- *Feb. 19, 1844 Turnbull, James Muter, M.D. Edin., M.R.C.P., Physician Royal Infirmary, 86, *Rodney-street.*
- Oct. 21, 1861 Unwin, William Andrew, 11, *Rumford-place.*
- Oct. 21, 1844 Vose, James Richard White, M.D. Edin., F.R.C.P., Physician Royal Infirmary, 5, *Gambier-terrace.*
- Dec. 2, 1872 Waite, William Henry, D.D.S., L.D.S., 10, *Oxford-street.*
- Mar. 18, 1872 Walker, George E., F.R.C.S., 58, *Rodney-street.*
- Mar. 18, 1861 Walker, Thomas Shadford, M.R.C.S., 82, *Rodney-street.*
- Jan. 27, 1862 Walmsley, Gilbert G., 50, *Lord-street.*
- Jan. 9, 1865 Walthew, William, *Phoenix Chambers*, and *Vine Cottage, Aughton.*
- Mar. 4, 1872 Ward, Thomas, *Brookfields House, Northwich.*

- Dec. 18, 1869 Waterhouse, Harold, 87, *Catherine-street*.
- Dec. 2, 1861 Weightman, William Henry, *Minster-buildings, Church-street, and Cambridge-road, Seaforth*.
- April 7, 1862 Whittle, Ewing, M.D., Lecturer on Medical Jurisprudence, Royal Infirmary School of Medicine, 77A, *Upper Parliament-street*.
- Jan. 18, 1868 Whitworth, Rev. W. A., M.A., 185, *Islington*.
- Jan. 8, 1872 Williams, Wellington A., 21, *Falkner-street*.
- Mar. 18, 1861 Wood, George S. (Messrs. Abraham & Co.), 20, *Lord-street, and Bellevue-road, Wavertree*.
- Nov. 14, 1870 Wood, John J. (Messrs. Abraham & Co.), 20, *Lord-street*.

HONORARY MEMBERS.

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- 1.—1888 The Right Hon. Dudley Ryder, Earl of Harrowby, K.G., D.C.L., F.R.S., *Sandon Hall, Staffordshire*, and *89, Grosvenor-square, London, W.*
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- 7.—1844 Peter Rylands, *Warrington*.
- 8.—1844 John Scouler, M.D., LL.D., F.L.S., *Glasgow*.
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- 15.—1851 Henry Clarke Pidgeon, *London*.
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- 20.—1861 Sir William Fairbairn, Bart., LL.D., C.E., F.R.S., *Polygon, near Manchester*.
- 21.—1861 Rev. Thomas P. Kirkman, M.A., F.R.S., *Croft Rectory, near Warrington*.
- 22.—1865 The Right Rev. H. N. Staley, D.D., Bishop of Honolulu, *Sandwich Islands*.
- 23.—1868 Edward J. Reed, C.B., *Hull*.
- 24.—1865 John Edward Gray, Ph. D., F.R.S., &c., *British Museum*.
- 25.—1865 George Rolleston, M.D., F.R.S., Linacre Professor of Physiology in the University of Oxford, *Oxford*.
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- 27.—1867 J. W. Dawson, LL.D., F.R.S., F.G.S., &c., Principal and Vice Chancellor of McGill University, *Montreal*.
- 28.—1868 Captain Sir James Anderson, *Atlantic Telegraph Company, London*.
- 29.—1870 Sir John Lubbock, Bart., M.P., F.R.S., *High Elms, Farnborough, Kent*.
- 30.—1870 Henry E. Roscoe, F.R.S., Professor of Chemistry in Owen's College, *Manchester*.
- 31.—1870 Professor Joseph Henry, Secretary to the Smithsonian Institute, *Washington, U.S.*
- 32.—1870 Professor Wyville Thompson, F.R.S., *Belfast*.
- 33.—1870 Joseph Hooker, M.D., F.R.S., *Royal Observatory, Kew*.
- 34.—1870 Professor Brown-Séquard, M.D.

- 35.—1870 John Gwyn Jeffreys, F.R.S., 25, *Devonshire-place, Portland-place, London.*
- 36.—1870 Thos. H. Huxley, LL.D., F.R.S., Professor of Natural History in the Royal School of Mines, *Jermyn-street*, and 26, *Abbey-place, St. John's-wood, London.*
- 37.—1870 John Tyndall, LL.D., F.R.S., Professor of Natural Philosophy in the Royal Institution, *London.*
- 38.—1870 Rev. Christian D. Ginsburg, LL.D., *Binfield, Bracknell, Berks.*
- 39.—1874 Alexander Agassiz.
- 40.—1874 Frederick Max Muller, LL.D., Professor of Comparative Philology, *Oxford.*
- 41.—1874 Sir Samuel W. Baker.

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LIMITED TO THIRTY-FIVE.

- 1.—1867 Albert C. L. G. Günther, M.A., M.D., Ph. D., British Museum, Editor of the "*Zoological Record.*"
- 2.—1867 J. Yate Johnson, *London.*
- 3.—1867 R. B. N. Walker, *Gaboon, West Africa.*
- 4.—1868 Rev. J. Holding, M.A., F.R.G.S., *London.*
- 5.—1868 Geo. Hawkins, *Colombo, Ceylon.*
- 6.—1868 J. Lewis Ingram, *Bathurst, River Gambia.*
- 7.—1869 George Mackensie, *Cebu, Philippine Islands.*
- 8.—1870 Rev. Joshua Jones, D.C.L., King William's College, *Isle of Man.*
- 9.—1874 Samuel Archer, Surgeon-Major, *Honduras.*
- 10.—1874 Samuel Booker, *Georgetown, Demerara.*
- 11.—1874 Coote M. Chambers, *Burrard's Inlet, British Columbia.*

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- 1.—Jan. 27, 1862 Captain John H. Mortimer, "America,"
(Atlantic.)
- 2.—Mar. 24, 1862 Captain P. C. Petrie, "City of London,"
Commodore of the Inman Line of American
Steam Packets. (Atlantic.)
- 3.—Feb. 9, 1868 Captain James P. Anderson, R. M. S. S.
"Africa," Cunard Service. Atlantic.
- 4.—Feb. 9, 1868 Captain John Carr (Bushby & Edwards),
ship "Scindia." (Calcutta.)
- 5.—Feb. 9, 1868 Captain Charles E. Price, R. N. R. (L. Young
& Co.), ship "Cornwallis." (Calcutta and
Sydney.)
- 6.—April 20, 1868 Capt. Fred. E. Baker, ship "Nippon."
(Chinese Seas.)
- 7.—Oct. 31, 1864 Captain Thomson, ship "Admiral Lyons."
(Bombay.)
- 8.—Oct. 31, 1864 Captain Alexander Browne (Papayanni),
S. S. "Agia Sofia." (Mediterranean.)
- 9.—April 18, 1865 Capt. Alexander Cameron (Boult, English
& Brandon), ship "Staffordshire." (Shang-
hai.)
- 10.—Dec. 11, 1865 Captain Walker, ship "Trenton."
- 11.—Mar. 28, 1868 Captain David Scott.
- 12.—Oct. 5, 1868 Captain Cawne Warren.
- 13.—Oct. 5, 1868 Captain J. A. Perry.
- 14.—Mar. 22, 1869 Captain Robert Morgan, ship "Robin Hood."
- 15.—April 29, 1872 Captain J. B. Walker, Old Calabar.
- 16.—April 29, 1872 Captain Alfred Horsfall, S. S. "Canopus."

LIBRARY.

DONATIONS DURING THE SESSION.

1878.

DATE ANNOUNCED.

DONORS.

OCTOBER 20th.

- Report of the British Association, Brighton,
1872 *Dr. Inman.*
- Climat, Geologie, Faune et Geographie Bo-
tanique du Brésil, by E. Liais. . *Brazilian Government.*
- On the National Importance of Scientific Re-
search, by Geo. Gore, F.R.S., Birmingham,
1873 *The Author.*
- A Law of Elliptic Motion, &c., by G. Hamilton,
F.C.S., &c., Liverpool, 1878 *The Author.*
- Mittheilungen der Geographischen Gesellschaft
in Wien—1st Series vol. 10, 1867, New
Series, vols. 1 to 4, 1868-71 *The Society.*
- The Canadian Journal, vol. 18, part 6, May
1868 *Canadian Institute.*
- The Life of Sir Benj. Thompson—Count Rum-
ford, with Notices of his Daughter, by Geo.
Ellis, 1 vol. Boston, 1872. *American Academy of Arts and
Sciences.*
- The Complete Works of Count Rumford, vol. 1,
Boston, 1870 . *American Academy of Arts and Sciences.*
- Memoires de la Société Imperiale des Sciences
Naturelles de Cherbourg, tomes 1 to 10,
1858-64 *The Society.*
- Journal of the Franklin Institute of Philadelphia
vol. 65 *The Institute.*

**Annual Reports of the Commissioner of the
Department of Agriculture, Washington, for
the years 1867-71, 5 vols.** *The Commissioner.*

**Abridged Reports of the Secretary of War,
Washington, for the years 1867-9, 8 vols.
.** *The Commissioner.*

Annual Reports ditto, 1870-2, 6 vols. *The Commissioner.*

**Smithsonian Contributions to Knowledge (4to)
vol. 17, 1872** *Smithsonian Institute.*

**Journal of the Royal Asiatic Society, London,
vol. 6, 1878** *The Society.*

**Journal of the Geological Society of London,
vols. 24 to 28, 1868-72** *The Society.*

**Journal of the Linnæan Society of London, vol.
18, Botany, 1878** *The Society.*

Ditto, vol. 11, Zoology, 1878 *The Society.*

Proceedings of Ditto, for 1872-8 *The Society.*

**Proceedings of the Royal Institution, vol. 6,
1878** *The Institution.*

NOVEMBER 8rd.

De Romanske Sprog og Folk, 1871. *University of Christiania.*
 Nordens ældste Historie af P. N. Munch,
 1872 *University of Christiania.*
 Uctstutter, vedtommende de ved Universitetet
 anordnede Lærereramina, 1871 . *University of Christiania.*
 Salbmagirje, 1871 *University of Christiania.*
 Recherches sur la Chronologie Egyptienne, par
 J. Lieblein, 1878 *University of Christiania.*
 Anaxagoras og Atomistiken af M. J. Monad,
 1870 *University of Christiania.*
 Bidrag til den antike Philosphe Historie, af Dr.
 G. V. Lyng, 1869 *University of Christiania.*
 Nogle Strobemærkninger om Bevidsthedens
 Væsen, m-m af C. Winter Hjelm, 1870.
University of Christiania.

Cantate för Hans Majestat Kong Karl, 1872.

University of Christiania.

The Ancient Vessel found in the Parish of Tune,

Norway, 1872 *University of Christiania.*

Memoires, Reale Istituto Lombardo, Milan . *The Institute.*

**i Classe di Scienze, Matematiche e
Naturali, series 3, vol. 12, fasc. 5, 1872**

**ii Classe di Lettere e Scienze-Morali, e
Politiche, series 3, vol. 12, fasc. 3, 1872**

**Rendiconti, series 2, vol. 5, fasc. 8 to 16,
1872**

Proceedings of the American Philosophical

Society, Philadelphia, nos. 89 and 90, 1872-8 *The Society.*

Proceedings of the Society of Antiquaries,

London, series 2, vol. 5, 1878 *The Society.*

Monthly Notices of the Royal Astronomical

Society, London, April to August, 1878 . *The Society.*

Report and Proceedings of the Geologists'

Association, London, 1872-8 *The Association.*

NOVEMBER 17th.

Astronomical and Meteorological observations

made during the year 1870 at the United

States' Naval Observatory, and published

under the direction of Rear-Admiral B. F.

Sands, Superintendent. Washington, 1873.

Also Appendices 1 and 2, containing observa-

tions on Zones of Stars with the Meridian

Transit Instrument and Mural Circle *The Superintendent.*

Catalogue of Stars observed during the interval

1845-71. Prepared by Professor Yarnall,

U.S. Naval Observatory, 1873 *The Superintendent.*

Results of Observations made at the U.S. Naval

Observatory with the Transit Instrument

and Mural Circle during the years 1853-60.

Prepared by Professors Yarnall, Major, and

Robinson, 1872 *The Superintendent.*

- Report of the Commissioner of Patents for the
years 1869-71, 7 vols. Washington . *The Commissioner.*
- Annual Reports of the Trustees of the Astor
Library of New York for the years 1868-78 . *The Trustees.*
- Memoires de la Société Imperiale des Sciences—
Nat. Cherbourg, Tome 17, 1878. Cata-
logue de la Bibliotheque, 1872 . . . *The Society.*
- Journal of the Society of Arts, London, vols.
5 to 8, 1856-60 . . . *The Society.*
- Proceedings of the Royal Geographical Society,
London, vol. 17, 1873, and Journal of ditto.
vol. 42, 1872 . . . *The Society.*
- Transactions of the Royal Medico-Chirurgical
Society, London, vols. 40 to 48, 1857-60 . *The Society.*
- Journal of the East Indian Association, London,
vols. 1 to 6, 1867-72 . . . *The Association.*
- “Nature,” vols. 1 to 7, London, 1868-78 . *The Editor.*
- Proceedings of the Zoological Society, London,
1872 . . . *The Society.*
- Report of the Birkenhead Literary and Scien-
tific Society, 1878 . . . *The Society.*

DECEMBER 1st.

- Journal of the Royal Institution of Cornwall,
nos. 13 and 14, Truro, 1872-3 . . . *The Institution.*
- Annual Report of the Plymouth Institute, vol.
4, part 4, 1878 . . . *The Institute.*
- Proceedings of the Literary and Philosophical
Society of Manchester, vol. 12, 1872-3 . *The Society.*
- Proceedings of the Numismatic Society of
Liverpool, no. 2, 1878 . . . *The Society.*
- Transactions of the Liverpool Chemists' Associa-
tion, 1871-2 . . . *The Association.*
- Proceedings of the Liverpool Naturalists' Field
Club, 1872-3 . . . *The Club.*

- Journal of the Liverpool Polytechnic Society,
85th Session, 1878 *The Society.*
- Abstract Proceedings of the Liverpool Geo-
logical Society, no. 14, 1878 *The Society.*
- Proceedings of the Liverpool Architectural and
Archæological Society, 25th Session, 1878 ... *The Society.*
- Annual Report of the Hull Literary and Philo-
sophical Society, 1878 *The Society.*
- Proceedings of the Philosophical Society of
Glasgow, vol. 8, part 2, 1878 *The Society.*
- Annual Report of the Royal Cornwall Poly-
technic Society, Falmouth, 1872 *The Society.*
- Transactions of the Geological Society of
Edinburgh, vol. 2, part 2, 1878 *The Society.*
- Report of the Philosophical Institution, Edin-
burgh, 1872-8 *The Institution.*
- Proceedings of the Royal Society of Edinburgh,
vol. 7, 1872 *The Society.*
- Journal of the Meteorological Society of
Scotland, nos. 87 to 89, Edinburgh, Jan.
to July, 1878 *The Society.*
- Proceedings of the Botanical Society of Edin-
burgh, vols. 1, 2, 3, 4, 5, 10 to complete the
series *The Society.*
- Transactions of the Royal Scottish Society of
Arts, Edinburgh, vol. 8, parts 3 and 4,
1870-2 *The Society.*
- Journal of the Royal Society of Dublin, vol. 6,
no. 41, 1872 *The Society.*
- Journal of the Royal Geological Society of
Ireland, vols. 2 and 3, Dublin, 1867-78 . . . *The Society.*
- Royal Irish Academy, Dublin—
Proceedings, vol. 10, part 4. Series 2,
vol. 1, parts 2 to 6 *The Academy.*
- Transactions, (4to), vol. 24, parts 16 and
17, vol. 25, parts 1, 2, 3 *The Academy.*

- Journal of the East Indian Association, London,
vol. 7, parts 1 and 2, 1878 *The Association.*
Transactions of the Royal Medico-Chirurgical
Society, London, vol. 56, 1878 *The Society.*
-

DECEMBER 15th.

- Journal of the Society of Arts, London, vol.
21, 1872-8 *The Society.*
Monthly Notices of the Royal Astronomical
Society, London, supplementary part, No-
vember, 1878 *The Society.*
Journal of the Geological Society, London, vol.
29, 1878 *The Society.*
Quarterly Journal of the British Meteorological
Society, London, vol. 1, N.S., parts 5 and 8,
January-October, 1878 *The Society.*
"Nature," vols. 8 and 9, 1872-8 *The Editor.*
Proceedings of the Natural History and
Philosophical Society of Belfast, 1872 *The Society.*
Proceedings of the Chatham Society, Liverpool,
1878 *The Society.*
Reports of the Royal Cornwall Geological
Society, Penzance, 1871-8 *The Society.*
Report on the Difference of Longitude between
Washington and St. Louis, by Professor
William Harkness, prepared under the
direction of Rear-Admiral B. F. Sands, of
Washington Naval Observatory, 1872 *Rear-Admiral Sands.*
On the Right Ascension of the Equatorial
Fundamental Stars, etc., by Professor F.
Newcomb, prepared under the direction of
Rear-Admiral B. F. Sands, Washington
Naval Observatory, 1872 *Rear-Admiral Sands.*
-

1874.

JANUARY 12th.

- Greenwich Observations for 1871, 4to, and
History and Description of the Water-
Telescope at Greenwich Observatory, 4to *Astronomer Royal*.
Proceedings of the Society of Antiquaries,
London, vol. 6, part 1, June 1878 . . . *The Society*.
Monthly Notices of the Royal Astronomical
Society, London, vol. 24, no. 1, November,
1878 . . . *The Society*.
Journal of the Chemical Society, London, for
1878, vol. 11 . . . *The Society*.
Proceedings of the Natural History, &c.,
Society, Bath, 1872 . . . *The Society*.
Proceedings of the Berwickshire Naturalists'
Club, Alnwick, 1868-72, 5 parts . . . *The Society*.
Bibliotheca Chethamensis, tomi 4 et 5 *Directors of Chetham
College, Manchester*.
Note by J. Clerke Maxwell, "On Hamilton's
Law of Elliptic Motion," &c. . . *Prof. Hamilton*.
Essays on Physical Geology, by Dr. Ricketts,
F.G.S . . . *The Author*.
Bulletin of the American Geographical Society,
New York, 11th November, 1878 . . . *The Society*.
-

JANUARY 26th.

- Transactions of the American Philosophical
Society (4to, O. S., vols. 1 to 6, 1789-1809,
N. S. vols. 1 to 18, 1810-1869, (being the
complete series) . . . *The Society*.
Memoires de la Société des Sciences Physiques
et Naturelles, de Bordeaux, tome 1, 2^e cahier,
1855, tome 4, 1^{er} cahier, 1866, tome 5,
complete, 1867, tome 6, complete, 1868, 8,
complete, 1872, 9, 1^{er} cahier, 1878 . . . *The Society*.

- Journal of the Anthropological Institute,
London, vol. 8, 1878 *The Institute.*
- Proceedings of the Royal Society, London, vol.
21, 1878 *The Society.*
- Transactions of the Royal Institution of British
Architects (4to) 1872-8 *The Institution.*
- Quarterly Journal of Science, London, No. 41,
January, 1874 *The Editor.*
- Proceedings of the Natural History and
Antiquarian Field Club, Bath, vol. 2, parts
1, 2, and 8, 1869-71 *The Society.*
- Proceedings of the Philomathic Society, Liver-
pool, 1872-8 *The Society.*
- Proceedings of the Royal Scottish Arboricultural
Society, Edinburgh. No. 20, 1878 *The Society.*
-

FEBRUARY 9th.

- The Great Trigonometrical Survey of India,
4to, vol. 1, containing the Standard Measure
and Base-Lines, &c., with a History of the
Survey 1800-80, by Col. J. T. Walker, R.E.,
F.R.S., &c., London, 1870 *Secretary of State for India.*
- Annual Report of the U. S. Geological Survey
for 1872, comprising the Yellowstone Terri-
tory, Montana, etc., compiled under the
direction of Dr. F. V. Hayden, U. S.
Geologist *Dr. Hayden.*
- Memoirs of the U. S. Geological Survey, 4to,
vol. 1, Extinct Vertebrate Fauna, by Joseph
Leidy, Washington, 1878 *Dr. Hayden.*
- Journal of the Franklin Institute of Phila-
delphia, vol. 56, 1878 *The Institute.*
- "Nature" to date *The Editor.*
- Quarterly Journal of the Scottish Meteorological
Society, no. 40, October, 1878 *The Society.*

FEBRUARY, 28rd.

- Annual Report of the Chief Signal Officer to the
War Department, Washington, 1872 *The Secretary of War.*
- Annual Report of the Smithsonian Institute,
Washington, 1871 *The Institute.*
- Smithsonian Miscellaneous Collections, vol. 10,
Washington, 1878 *The Institute.*
- Journal of the Canadian Institute, vol. 14, part
1, Toronto, November, 1878 *The Institute.*
- Bulletin of the U. S. Geological and Geo-
graphical Survey of the Territories, no. 1,
January, 1874 *Dr. Hayden.*
- Journal of the Statistical Society, London,
vol. 86, 1878 *The Society.*
- Proceedings of the Geologists' Association,
London, vol. 8, part, 4, 1874 *The Association.*
- Monthly Notices Royal Astronomical Society,
London, vol. 84, parts 2 and 8, December,
1878, and January, 1874 *The Society.*
-

MARCH 9th.

- Proceedings of the Boston Society of Natural
History, 1871-2 *The Society.*
- Memoirs, ditto No. 5, Description of *Balæno-
ptera Musculus*, by Thomas Dwight, Jun.,
M.D., 1872 *The Society.*
- Memoirs ditto No. 6, on the Carboniferous *Myri-
apoda* preserved in the stumps of *Sigellaria*
in Nova Scotia, by Samuel H. Scudder, 1878 *The Society.*
- Annual Report of the Board of State Charities
of Massachusetts, 1871-2, 1 vol *The Board.*
- Annual Report of the Board of Education of
Massachusetts, 1878, 1 vol. *The Board.*
- Annual Reports of the Board of Agriculture of
Massachusetts, 1871-2, 2 vols. *The Board.*

- Harvard University Catalogue and Report,
1872-8 *The University.*
- Proceedings of the American Association for the
Advancement of Science, 21st meeting, 1872 *The Association*
- Bulletin of the Essex Institute, vol. 4, Salem,
1872 *The Institute.*
- Map of the Sources of Snake-River and Yellow-
stone National Park *Dr. Hayden.*
- Report of the U.S., Geological Survey, 1867-9,
1 vol., Washington, 1878 *Dr. Hayden.*
- Synopsis of the *Acrididæ* of North America, by
Professor Cyrus Thomas (4to), U.S. Geo-
logical Survey *Dr. Hayden.*
-

MARCH 23rd.

- Note on the Structure of the Skeleton of
Euplectella Aspergillum, by Thomas Higgin . *The Author.*
- Transactions of the Royal Cornwall Geological
Society, vol. 8, Penzance, 1878 *The Society.*
- Journal of the East Indian Association, London,
vol. 7, part 3, 1878 *The Association.*
- Journal of the Geological Society, London, vol.
80, part 1, February, 1874 *The Society.*
- "Nature" to date *The Editor.*
- Proceedings of the American Academy of Arts
and Sciences, Boston, vol. 8, Sheets 52 to
68, 1872 *The Academy.*
- Annals of the Lyceum of Natural History, New
York, vols. 9 and 10, 1870-1 *The Lyceum.*
- Proceedings of the Lyceum of Natural History,
New York, vol., Sheets, 1 to 15, 1871. . *The Lyceum.*
- Proceedings of the Academy of Natural Sciences
of Philadelphia, 1871-2 *The Academy.*
- Miscellanea, U.S. Geological Survey, Nos. 1
and 2 *Dr. Hayden.*

APRIL 6th.

- On the Physical Cause of Ocean Currents,
Three Papers ; What Determines Molecular
Action ? One Paper ; by James Croll, of the
Geological Survey, Scotland *The Author.*
- La Constitution Physique du Soleil, par A.
Gazan, Antibes, 1878 *The Author.*
- Memoires de la Société des Sciences, &c.,
Bordeaux, tome 7, 1869 *The Society.*
- Reports of the Regents of the University of
the State of New York, 1862-72 . . . *The Regents.*
- Reports of the State Library of New York,
1862-78, and Catalogue, 6 vols. . . . *The Board.*
- Reports of the State Museum of Natural
History of New York, 1862-71 *The Board.*
- Reports of the Meteorology of New York,
1880-70, 2 vols. *The Observatory.*
- Report of the Pennsylvanian Board of Edu-
cation, Philadelphia, 1878 *The Board.*
- Map of Montana and Wyoming, U. S.
Geological Survey *Dr. Hayden.*
- Monthly Reports of the Department of
Agriculture, Washington, 1868-71, 4 vols.
The Commissioners.
- Smithsonian Contributions to Knowledge, 4to,
vols. 2 to 12, 1851-62 *The Institute.*
- Transactions of the Royal Society of Literature,
London, up to 1872, 8 vols. . . . *The Society.*
- Proceedings of the Royal Society, London, vol.
22, parts 140 to 150, 1878-4 *The Society.*
- Proceedings of the Royal Institution, London,
vol. 7, parts 1 & 2, 1878-4 *The Institution.*
- Proceedings of the Zoological Society, London,
1878, parts 1 and 2 *The Society.*
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APRIL 20th.

Monthly Notices of the Royal Astronomical Society, London, Feb., 1874.	<i>The Society.</i>
Journal of the Chemical Society, London, nos. 188 and 184, Jan., and Feb., 1874	<i>The Society.</i>
"Nature" to date	<i>The Editor.</i>
"Science-Gossip" April, 1874	<i>The Editor.</i>
Transactions of the Historic Society of Lancashire and Cheshire, 1872-8	<i>The Society.</i>
The Flora of Liverpool, and appendix <i>Naturalists' Field Club.</i>	
Report and Supplementary Catalogue, No. 1, of the Free Public Library of Liverpool	<i>The Committee.</i>
Transactions of the Natural History Society of Northumberland and Durham, Newcastle-on Tyne, vol. 5, part 1, 1878	<i>The Society.</i>
Proceedings, 1 vol. and Journal, 1 vol. of the Asiatic Society of Bengal, Calcutta, 1878	<i>The Society.</i>
Journal of the Franklin Institute of Philadelphia, vol. 67, parts for Jan., and Feb., 1874	<i>The Institute.</i>
Two years in Peru, 2 vols. by Thos. J. Hutchinson, F.R.G.S. &c., H.M. Consul, Callao, 1874	<i>The Author.</i>

LIST OF SOCIETIES, ACADEMIES, INSTITUTIONS, ETC.,
TO WHICH THIS VOLUME IS PRESENTED.

(The Asterisk denotes those from which Donations have been received this Session.)

<i>Alnwick</i>	. . .	*Berwickshire Naturalists' Field Club.
<i>Bath</i>	. . .	*Natural History Society.
<i>Belfast</i>	. . .	*Naturalists' Field Club.
<i>Bristol</i>	. . .	*Naturalists' Society.
<i>Birkenhead</i>	. .	Free Public Library
<i>Birkenhead</i>	. .	*Literary and Scientific Society.
<i>Bordeaux</i>	. . .	*Société des Sciences, etc.
<i>Boston</i>	. . .	*American Academy of Arts and Sciences.
<i>Boston</i>	. . .	*Natural History Society.
<i>Boston</i>	. . .	*The Massachusetts Boards of Agriculture, Education, etc.
<i>Brussels</i>	. . .	Académie Royale des Sciences, etc., de Belgique.
<i>Chester</i>	. . .	*Natural History Society.
<i>Chester</i>	. . .	Architectural and Archæological Society.
<i>Cambridge (Mass.)</i>		*Harvard University.
<i>Cambridge (Mass.)</i>		*The Museum.
<i>Calcutta</i>	. . .	*Royal Asiatic Society of Bengal.
<i>Calcutta</i>	. . .	The Geological Survey.
<i>Connecticut</i>	. .	*Academy of Arts and Sciences.
<i>Cherbourg</i>	. . .	*Société Imperiale des Sciences, etc.
<i>Christiania</i>	. .	*The University.
<i>Dublin</i>	. . .	*Royal Irish Academy.
<i>Dublin</i>	. . .	*Royal Geological Society of Ireland.
<i>Dublin</i>	. . .	*Royal Society.

<i>Edinburgh</i>	.	.	*Scottish Society of Arts.
<i>Edinburgh</i>	.	.	*Botanical Society.
<i>Edinburgh</i>	.	.	*Meteorological Society of Scotland.
<i>Edinburgh</i>	.	.	Royal Physical Society.
<i>Edinburgh</i>	.	.	*Royal Society.
<i>Edinburgh</i>	.	.	The Philosophical Institution.
<i>Edinburgh</i>	.	.	*Geological Society.
<i>Falmouth</i>	.	.	*Royal Cornwall Polytechnic Society.
<i>Glasgow</i>	.	.	*Philosophical Society.
<i>Glasgow</i>	.	.	Geological Society.
<i>Greenwich</i>	.	.	*The Observatory.
<i>Hull</i>	.	.	*Literary and Philosophical Society.
<i>Halifax.</i>	.	.	Literary and Philosophical Society.
<i>Königsberg.</i>	.	.	*Königlichen Physikalisch Gesellschafft.
<i>London</i>	.	.	*Society of Arts.
<i>London</i>	.	.	*Royal Asiatic Society.
<i>London</i>	.	.	*Society of Antiquaries.
<i>London</i>	.	.	*Anthropological Institute.
<i>London</i>	.	.	*Royal Astronomical Society.
<i>London</i>	.	.	British Association.
<i>London</i>	.	.	British Museum.
<i>London</i>	.	.	*Chemical Society.
<i>London</i>	.	.	Clinical Society.
<i>London</i>	.	.	*Royal Geographical Society.
<i>London</i>	.	.	*Geological Society.
<i>London</i>	.	.	*Geologists' Association.
<i>London</i>	.	.	*Linnæan Society.
<i>London</i>	.	.	*Meteorological Society.
<i>London</i>	.	.	*Royal Society of Literature.
<i>London</i>	.	.	*Royal Society.
<i>London</i>	.	.	*Royal Institution.
<i>London</i>	.	.	*Statistical Society.
<i>London</i>	.	.	*Medico-Chirurgical Society.
<i>London</i>	.	.	*Royal Institute of British Architects.
<i>London</i>	.	.	Royal Microscopical Society.
<i>London</i>	.	.	*East Indian Association.

<i>London</i>	. . .	*Zoological Society.
<i>London</i>	. . .	*Editor of "Nature."
<i>London</i>	. . .	*Editor of Quarterly Journal of Science.
<i>London</i>	. . .	*Editor of Science Gossip.
<i>London</i>	. . .	Editor of Geological Magazine.
<i>Leeds</i>	. . .	*Philosophical and Literary Society.
<i>Leeds</i>	. . .	Geological Society of West Riding of Yorkshire.
<i>Liverpool</i>	. . .	*Architectural Society.
<i>Liverpool</i>	. . .	*Historic Society.
<i>Liverpool</i>	. . .	*Geological Society.
<i>Liverpool</i>	. . .	*Philomathic Society.
<i>Liverpool</i>	. . .	*Polytechnic Society.
<i>Liverpool</i>	. . .	*Naturalists' Field Club.
<i>Liverpool</i>	. . .	*Chemists' Association.
<i>Liverpool</i>	. . .	*Numismatic Society.
<i>Liverpool</i>	. . .	Royal Institution.
<i>Liverpool</i>	. . .	*Free Public Library.
<i>Liverpool</i>	. . .	Medical Institution.
<i>Liverpool</i>	. . .	Lyceum Library and News Room.
<i>Liverpool</i>	. . .	Athenæum Library and News Room.
<i>Leicester</i>	. . .	Literary and Philosophical Society.
<i>Manchester.</i>	. . .	*Literary and Philosophical Society.
<i>Manchester.</i>	. . .	Free Public Library.
<i>Manchester.</i>	. . .	*Chetham Library.
<i>Milan</i>	. . .	*Reale Istituto Lombardo.
<i>Newcastle-on-Tyne</i>	. . .	*Natural History Society.
<i>New York</i>	. . .	*Astor Library.
<i>New York</i>	. . .	*American Geographical Society.
<i>New York</i>	. . .	*Lyceum of Natural History.
<i>New York</i>	. . .	*State University.
<i>New York</i>	. . .	*State Library.
<i>New Haven</i>	. . .	*Connecticut Academy.
<i>Oxford</i>	. . .	Ashmolean Society.
<i>Plymouth</i>	. . .	*Plymouth Institute.
<i>Penzance</i>	. . .	*Royal Geological Society of Cornwall.

<i>Philadelphia</i>	.	.	.	*American Philosophical Society.
<i>Philadelphia</i>	.	.	.	*Academy of Natural Sciences.
<i>Philadelphia</i>	.	.	.	*Franklin Institute.
<i>Presburg</i>	.	.	.	Vriens für Natur-Kunde.
<i>Salem (Mass.)</i>	.	.	.	*Essex Institute.
<i>Salem (Mass.)</i>	.	.	.	*American Association for the Advancement of Science.
<i>Stockholm</i>	.	.	.	Academy of Sciences.
<i>Southport</i>	.	.	.	*Literary and Philosophical Society.
<i>Surrey</i>	.	.	.	Archæological Society.
<i>Truro</i>	.	.	.	*Royal Institution of Cornwall.
<i>Taunton</i>	.	.	.	Somerset Archæological Society.
<i>Toronto</i>	.	.	.	*Canadian Institute.
<i>Vienna</i>	.	.	.	*Geographischen Gesellschaft.
<i>Whitby</i>	.	.	.	*Literary and Philosophical Society.
<i>Washington</i>	.	.	.	National Observatory.
<i>Washington</i>	.	.	.	*Naval Observatory.
<i>Washington</i>	.	.	.	*The Commissioner of Patents.
<i>Washington</i>	.	.	.	*The Commissioner of Agriculture.
<i>Washington</i>	.	.	.	*Smithsonian Institution.
<i>Washington</i>	.	.	.	*The Secretary of War.
<i>Washington</i>	.	.	.	*The Geological Survey.
<i>York</i>	.	.	.	Philosophical Society.

Dr. *The Literary and Philosophical Society, in Account with the Treasurer.* **Cr.**

Examined and found correct,
ISAAC ROBERTS,
EDWARD DAVIES, } **AUDITORS.**

PROCEEDINGS
OF THE
LIVERPOOL
LITERARY AND PHILOSOPHICAL SOCIETY.

ANNUAL MEETING.—SIXTY-THIRD SESSION.

ROYAL INSTITUTION, October 6th, 1878.

ALBERT JULIUS MOTT, PRESIDENT, in the Chair.

THE Minutes of the last Meeting of the previous Session were read and confirmed.

The Honorary Secretary then read the following

REPORT.

The Report of Council for the Sixty-second Session is a brief one. The character and reputation of the Society have been sustained by the proceedings of the ordinary meetings; the attendance of members has been satisfactory; the miscellaneous communications were varied and interesting, and the papers read of considerable value; while the discussions were maintained with spirit and ability.

The Session has been distinguished by the inauguration of the Roscoe Lectures, the first of which, delivered by Professor Max Müller, on "Darwin's Philosophy of Language," gave the highest gratification to all who heard it, and fully assured your Council that, in instituting this

series of annual addresses from the most eminent men, they have imparted renewed vigour to the intellectual life of the Society. It is therefore with great pleasure that the Council have now to report, that they have completed arrangements for the delivery of the second Roscoe Lecture on the 24th of November next. The lecturer selected is Dr. W. B. Carpenter, F.R.S., and his subject will be "The Psychology of Belief." The numerical strength of the Society in ordinary members is 207, an increase of 6 upon that of last year. The list of honorary members has been reduced by the decease of 3, Professor Rankine being one of these. The number of corresponding members and associates remains as before. The following gentlemen are nominated from the body of ordinary members, for election on the new Council:—Thomas Higgin, John James Drysdale, M.D., William Carter, M.B., Charles H. Stearn, and Dr. Rickard.

The Honorary Treasurer next read the Annual Statement of the Society's Finances, which was approved of and passed, on the motion of Mr. J. F. Robinson, seconded by Mr. Owen.

The election of Officers and the Ordinary Members of the Council was then proceeded with, when the following gentlemen were appointed: Vice-Presidents—Alfred Higginson, M.R.C.S., Thos. J. Moore, Cor. Mem. Z.S., Rev. W. Kennedy-Moore, M.A.; Honorary Treasurer—Richard C. Johnson; Honorary Secretary—James Birchall; Honorary Librarian—Alfred Morgan; Members of Council—Edward Davies, F.C.S., Alfred E. Fletcher, F.C.S., Ewing Whittle, M.D., Joseph F. Robinson, J. Campbell Brown, D.Sc., &c., Rev. W. H. Dallinger, F.R.M.S., Geo. S. Wood, Isaac Roberts, F.G.S., Rev. Jacob Prag, T. Higgin, John James Drysdale, M.D., M.R.C.S., C. H. Stearn, W. Carter, M.B., W. Rickard, LL.D.

The Secretary then read over the names of the Associates, all of whom were re-elected.

Mr. THOS. J. MOORE introduced to the Meeting Mr. Edwyn C. Reed, of the Museo Nacional, Santiago de Chili who had come over to England to work up the extensive collections in Natural History which he had made during a residence of ten years in Chili.

Two casts of small wooden implements from Easter Island, carved with hieroglyphics, and presented to the Free Museum by Mr. Reed, were exhibited, and examined with considerable interest.

The President then read his Second Inaugural Address, which will be found at length in a subsequent part of the volume.* Ladies were invited to this Meeting.

FIRST ORDINARY MEETING.

ROYAL INSTITUTION, October 20, 1878.

ALBERT JULIUS MOTT, PRESIDENT, in the Chair.

Ladies were present at this Meeting, by invitation from the Council.

Messrs. George Day, Edgar S. Holland, and Richard Johnson were unanimously elected Ordinary Members.

Dr. CARTER showed two bottles, each of which contained pieces of uncooked Cabbages, one of which had been grown on a sewage farm, the other on ordinary land. In the top of each bottle was inserted a piece of lead paper. The Cabbages were cut up at the same time, with the same knife, and placed in similar bottles. In eleven days the non-sewage grown Cabbage began to colour the paper, and after six weeks had made it quite black, while the sewage grown one, after the longer time, had not in the least coloured the paper. A lengthy discussion followed on the wholesomeness of vegetables grown on sewage farms, in which the Rev. H. H.

* See page 1.

Higgins, Drs. Nevins and Brown, and Messrs. Higginson and Davis took part.

The Rev. W. KENNEDY-MOORE, M.A., exhibited a Newspaper, printed in Africa, half in English and half in the Kaffir language.

MR. T. J. MOORE exhibited the following recent donations to the Free Museum :—

A specimen of the beautiful sponge from the Philippine Islands, now so well known as the Venus's Flower Basket (*Euplectella aspergillum*); the peculiarity being that instead of the small parasitic crustaceans usually found inhabiting the interior, this example contains huge *Isopod* crustaceans, an inch in length; also a magnificent sponge found in the same region as the *Euplectella*, seemingly identical with the *Meyerina clavata*, lately described by Dr. Gray. As yet only three or four specimens are known. This example measures twenty-eight inches in length, is covered with most delicate net-work, and has long siliceous anchoring filaments like the *Euplectella*, but, unlike those, they traverse the whole interior and protrude above the apex, being in the interior laced and interwoven with other fibres in a most intricate manner. A few parasitic crustacea are to be seen here and there within, but are of small size. Both these specimens are the gift of Capt. J. H. Snook, late commander of the ship "T. E. Lemon."

A collection of Corals, Echinoderms, Sponges, &c., from Port Royal, Jamaica, collected and presented by Samuel Archer, Esq., Surgeon-Major, late 98th Regiment. Among them were several fine specimens of Corallines, Star-fishes, and Sea-urchins, and some remarkable examples of the egg-capsules of two species of Mollusca; one set evidently of a species of *Cassis*, consisting of a long series of leathery capsules united by a common ligament, and the other, as yet undetermined, consisting of numerous tiny goblet-

like structures of great beauty attached to the shell of a *Pinna*.

The Rev. H. H. HIGGINS then read a paper on "The Arrangement of Invertebrate Animals in the Free Museum of Liverpool." *

After this Dr. Nevins explained, by a number of experiments, the place of Ozone in Nature. A lively discussion followed between Dr. Campbell Brown and Mr. E. Davies, F.C.S., in which also Dr. Nevins took part, with reference to the Electro-chemical theory of the cause of Ozone. The discussion was adjourned to a future meeting.

SECOND MEETING.

ROYAL INSTITUTION, November 8rd, 1878.

ALBERT JULIUS MOTT, PRESIDENT, in the Chair.

Ladies were invited to this Meeting.

The Rev. E. M. Geldart, M.A., and Messrs. Christopher Snowdon, Robert Gordon, Hamilton Lee, and Harold Lee, were unanimously elected Ordinary Members.

The PRESIDENT made some observations on the present position of Dr. Livingstone.

Mr. JOSEPH BOULT suggested the propriety of founding one or two scholarships in commemoration of the first observation of the transit of Venus by Jeremiah Horrocks. The subject was referred to the Council for further consideration.

Mr. RICHMOND LEIGH exhibited two nests of the Weaver Bird from Penang, "one being the nest of the male and the other of the female." †

Mr. B. L. BENAS then read a paper on "Semitic Legends." ‡

* Appended to Volume.

† See Jerdon's *Birds of India*, vol. ii., in reference to this question.

‡ See page 249.

THIRD MEETING.

ROYAL INSTITUTION, November 17th, 1873.

ALBERT JULIUS MOTT, PRESIDENT, in the Chair.

Ladies were present at this Meeting.

The PRESIDENT commenced the business with some observations on Dr. Huxley's recent address, as Rector of Aberdeen University, on the great number of subjects now required from students in the public examinations, the desirability of curtailing them, and confining the attention of each student to a definite list. He then entered into an explanation of the waves of light, and their connexion with the spectrum.

Mr. PICTON introduced Mr. ROBERT GORDON, C.E., a new member, and the latter then exhibited some Burmese Buddhist drawings, illustrative of the Cosmogony. He also exhibited as an illustration of high artistic power common in Burmah, the drawing of an elaborate design for wood-carving on a punka, made by a Burmese workman.

Mr. THOMAS HIGGIN stated that Mr. Moore had placed in his hands for examination one of the specimens of *Euplectella aspergillum*, from the collection of the Liverpool Free Museum, which proved to be very interesting, since it revealed the composition of the network of the skeleton, which had not hitherto been fully known, notwithstanding the attention these beautiful Sponges have attracted since Professor Owen first described the species in 1841, and especially since specimens became abundant. *

* Transactions of the Zoological Society of London, vol. iii. p. 208 pl. 13.

The Sponge in the Liverpool Museum, now referred to,* is rigid only for a few inches from the base, and is flexible throughout the remainder of the tube. The rigidity of these Sponges is caused by a coating of siliceous material, which, for convenience sake, has been called vitreous, in which the spicules composing the network are enclosed. This coating being of the same nature as the spicules themselves, obliterates their outlines, and in the rigid specimens it is impossible to distinguish them and trace them out. In the flexible part of this specimen, however, we have the spicules all placed in position, ready for the vitreous coating to be flowed over them, but entirely free from it. Each spicule can be distinctly seen, and we now learn that the vitreous coating is not deposited until the spicules have all been produced and placed in the position they are to occupy in the beautiful network of the skeleton.

The squarish meshes are formed by an arrangement of extremely large four-rayed spicules, the arms of which lie longitudinally and transversely. These spicules do not require to be measured under the microscope by the 100th or 1,000th of an inch, but may be measured with an ordinary pocket rule. Each transverse arm extends over about three of the areas, so that from the tip of one to the tip of the other is about three-quarters of an inch, and the longitudinal arms are twice as long.

The diagonal lines, and all the fine filaments of the network, are the arms of four and six-rayed spicules, only three of which however are usually produced, the others being more

* This specimen of *Euplectella*, referred to by Mr. Higgin in the above communication, is an immature example covered with dried sarcode, and obtained in London, in 1866, from the first importation of these beautiful objects. It is referred to by Prof. Wyville Thomson in his "Letters from H.M.S. Challenger," published in *Good Words* for July, 1873, p. 510. See also the *Annals and Magazine of Natural History* for January, 1874, pp. 44-48, for an amplification of the above notes by Mr. Higgin, and a full-page plate in illustration thereof.—T. J. MOORE.

or less suppressed or abortive. These arms are of great length, and being very slender, are twisted and turned in a variety of ways to suit the pattern of the network; they terminate in a kind of spear-head form, which is spined.

The open network of the mouth of the tube is composed of similar spicules, interwoven together.

The exterior ridges, or frills, are also built up of spicules of the same form; the arrangement being, that the two long arms, or rays, lie along the network of the skeleton, whilst the third arm (which is a short or abortive one) stands up perpendicularly to the surface, and the long slender arms of other spicules of the same kind (in some of which all the transverse rays are suppressed) are interlaced amongst these short upright arms.

The meshes, or areas, being only about an eighth of an inch square, the arms of the large spicules which form them necessarily extend towards each other, meet, and lie along each other, the tapering end of one running towards the thickest part of another. Along the arms are placed long, straight, and very slender spicules, the ends of which are spined for a considerable distance up the shaft.

Exteriorly long straight spicules reach along the longitudinal lines from the base of the sponge, some of which are smooth and others barbed.

Numbers of small hexradiate spicules are interspersed throughout the network, some of which are very stout and smooth, but the bulk are very slender, and are spined at the ends of the arms, one of which is usually produced to a great length. The flesh spicules are the two kinds of "rosettes" described and figured by Dr. H. J. Carter in the November number of "The Annals and Magazine of Natural History," plate 18, figs. 4 and 11; 1878.

Mr. Consul HUTCHINSON, from Callao, was present at the meeting.

Messrs. Josiah Marples and John Mellor were unanimously elected Ordinary Members.

Mr. C. H. STEARN then read a paper on "The Expansion of the F line of Hydrogen, and its bearing on Solar and Stellar Physics."* The communication was illustrated by some very beautiful experiments.

Dr. BROWN then resumed the discussion on Ozone, which closed the evening's proceedings.

An Extraordinary Meeting was held in St. George's Hall, 24th November, 1878. ALBERT J. MOTT, President, in the Chair.

Dr. W. B. CARPENTER, F.R.S., delivered the Second Roscoe Lecture, on "The Psychology of Belief."†

FOURTH MEETING.

ROYAL INSTITUTION, December 1st, 1878.

ALBERT JULIUS MOTT, PRESIDENT, in the Chair.

Ladies were present at this meeting. Mr. E. Davies, F.C.S., gave a communication on Ozone, with special reference to its alleged health-promoting qualities and the extent of its existence in the atmosphere.

Mr. H. H. STATHAM, junior, then read a paper on "The Life and Literary Genius of George Crabbe."

FIFTH MEETING.

ROYAL INSTITUTION, December 15th, 1878.

ALBERT JULIUS MOTT, PRESIDENT, in the Chair.

The President announced the death of Professor Agassiz, one of the Honorary Members of the Society, the news of

* See Page 327.

† See Page 45.

which had reached Liverpool that evening by telegraph. A vote of sympathy and condolence with the family of Professor Agassiz was moved by Mr. T. J. Moore, and seconded by the Rev. H. H. Higgins, who expressed, in feeling terms, the eminent worth and exalted services of the deceased, and were followed by others in a similar strain. At the wish of the meeting the Rev. H. H. Higgins undertook to convey to the family of Professor Agassiz the sympathies and kindly feeling which had been shown by the members present at the meeting.

The President exhibited some casts of the inscriptions on the relics, from Easter Island, (lately presented to the Free Museum by Mr. Edwyn C. Reed,) and referred to in his Inaugural Address. Some observations on these inscriptions were made by Messrs. Picton and Newton. Mr. Picton next exhibited a gold medal, struck on the occasion of the birth of the young King of Rome, son of Napoleon I.

Mr. THOMAS HIGGIN introduced Mr. Green, who exhibited nineteen photographs of scenery in Colorado, and on the Yellowstone and Madison Rivers, taken by Mr. Jackson, photographer to the United States Scientific Explorations Expedition, under Professor Dr. F. V. Hayden. Mr. Green gave the following account of the country represented, the district being very remarkable in character, and possessing geysers, hot springs, and other phenomena such as do not exist in any other part of the known world.

Professor Hayden is chief of the U. S. Government Scientific Exploration Expeditions. These expeditions, consisting of professors of geology, botany, zoology, and other natural sciences, with surveyors and a photographer, are sent out every summer at the expense of the U. S. Government, to visit some of the wild unknown parts of the territories, and to report upon the botany, animal life, minerals, climate, adaptability or otherwise for agriculture, &c. These reports

are published at the expense of the Government for the benefit of the public, under the editorship of Professor Hayden; the object of the Government being, that the territories may become inhabited, and the latent wealth which they contain utilized.

The portion of the Continent visited during the last two or three summers contains scenery of a most extraordinary character; so much so, that a portion of the country, as large as North Wales, has been selected by Government to be reserved, with all its natural wonders, as a public park for ever. There are geysers, hot springs, and hot lakes, surpassing anything of the kind in the known world. The rich and brilliant colours composing some of the landscape scenes are wonderful. Hundreds of the remains of animals previously unknown to science have been found in the geological deposits, and there are some novelties in the living animal kingdom. The explorers have also found the bones of pre-historic human inhabitants, with the flint implements and ornaments used by them, which must give rise to much speculation. I just mention these scanty facts, thinking they will interest you, and I will now only give a few explanations of some of the photographs which I have culled from the Report of 1872.

1.—The first is a view of Mount Hayden, named after the Professor. The mountain resembles in appearance the Matterhorn, in Switzerland; the height is 18,838 feet. The ascent is extremely difficult, but the energies of Messrs. Stevenson and Langford, of the expedition, overcame all obstacles. The view from the top embraces a diameter 150 miles, and for grandeur, vastness, and variety, is nowhere excelled in the Rocky Mountains. On the top were found stones, arranged in such a manner as to show that it had been visited by man at some remote period.

2.—“The Mountain of the Holy Cross.” The Cross is

formed with snow lying in the hollows of the mountain, and is seen as in the photograph at all seasons. The length of the Cross is 1500 feet.

3.—The Castle Geyser, on the Madison River. It is the most beautiful spring in the Upper Geyser Basin of the Madison. Near this spring is another, called the Hot Spring Cone, or the "Fish Pot," from the fact that it extends out into the lake several feet, so that one can stand on the siliceous mound and hook the trout from the cold waters of the lake, and, without moving, boil them in the steaming hot waters of the spring.

4.—A dead Geyser, called from its shape "The Cap of Liberty."

5.—The lower fall of the Yellowstone River. "The river suddenly narrows to a width of 100 feet and rushes over a ledge of trachyte, falling 397 feet. The water at the edge of the fall is very deep, and of a deep green colour. Huge boulders thrown in are carried by the force of the current far out from the edge of the fall. The immense body of water, on reaching the bottom of the Cañon, seems to dissolve itself into spray, and then recovering flows down the gorge an emerald green stream dashed with patches of white. Taken in connection with the varied tints of the Cañon itself, red, yellow, orange, white, the dark green pines fringing the top, and the bright green spray-nourished moss on the sides of the fall, we have a scene of almost unequalled magnificence and grandeur. It is a scene of which one never tires, and in the description of which language fails."

6.—The Gateway to the Garden of the Gods. The Garden of the Gods is two miles north of Colorado City. This interesting and peculiar place is a valley in the foot hills of the range, and is inclosed in almost a vertical wall of sandstone. The entrance is through the beautiful gate—an

opening through one of the ridges of red sandstone. The estimated height of this ridge is 800 feet.

In the Garden are some remarkable rocks, including Montezuma Cathedral, shown in another photograph, and so named in consequence of its resemblance to the ruins of an ancient cathedral. Some of the other photographs consist of views of snow-clad mountain tops, hot springs, and geysers, and one of very curious eroded rocks, looking at a distance like huge vases. There are a few stereographs of other portions of scenery. I trust that the few remarks which I have made have not been tedious, and hope some of your members will read the business-like reports furnished by the professors of the expedition, as I am sure you will find much to interest you.

Messrs. Joseph Brass, W. Grisewood, Henry Hutton, and E. W. Parnell were unanimously elected Ordinary Members.

The Rev. T. P. KIRKMAN, M.A., F.R.S., then read a paper on "The Languages commonly understood in Judea eighteen hundred years ago." An interesting discussion followed, in which Messrs. Picton, Newton, and Patterson, and the Revs. E. M. Geldart and J. Prag took part.

SIXTH ORDINARY MEETING.

ROYAL INSTITUTION, January 12th, 1874.

ALBERT JULIUS MOTT, PRESIDENT, in the Chair.

Ladies were again invited.

Mr. A. E. FLETCHER, F.C.S., brought under the notice of the Meeting a Paper, recently sent to the Royal Society, by Mr. W. CROOKES, F.R.S., detailing experiments he had made on the attraction or repulsion which bodies at different temperatures exercise on one another. A ball is delicately

suspended, and a mass, either hotter or colder than the ball, is made to approach it. Mr. Crookes found that

I. When the ball is in air of ordinary density.

(a) If the mass is colder than the ball it repels the ball.

(b) If the mass is hotter than the ball it attracts the ball.

II. When the ball is in vacuum.

(a) If the mass is colder than the ball it attracts the ball.

(b) If the mass is hotter than the ball it repels the ball.

III. When the ball is in a partial vacuum a point may be found where there is neither attraction nor repulsion.

Various speculations have been based on these statements with a view to explain some astronomical phenomena.

Mr. T. J. MOORE brought under the notice of the Meeting a drawing of the *Didunculus*, from the Samoan, or Navigators' Islands, and copies of most of the known pictures of the *Dodo*, in order to point out that the recent announcement in the public papers of the shipment of a living *Dodo*, from the Samoan Islands, would, in all probability, prove to be founded upon a specimen of the *Didunculus*, a modern discovery of excessive rarity in collections, and in extreme danger of being exterminated, as the *Dodo* of the Mauritius was exterminated soon after its discovery in the 17th century. Mr. Moore also exhibited a number of interesting specimens of Starfishes, dredged off Pisagua, on the coast of Peru, in twenty-three fathoms water, and presented to the Free Public Museum by Capt. J. A. Perry, an Associate of the Society. He read a letter from Capt. Mortimer, an Associate of the Society, dated San Francisco, Dec. 17, in which he described the principal objects of interest met with during the voyage thither. Among the subjects mentioned

are the following:—"A number of small Cephalopods, of which I passed through great shoals off the River Plate. I caught, and was much interested with, some of the gigantic Alga, made doubly interesting by Darwin's account of it.* One piece which I hauled on deck was 40 feet long, and at an inch in diameter bore a strain of 200 lbs. After trying its edible qualities on our pigs, which greedily ate it, I had prepared from its spores of recent growth a very palatable and, as it proved, wholesome salad." Accompanying the letter was a photograph of the late Professor Agassiz, for presentation to the Society, taken in the previous year at San Francisco, on his landing from his Expedition round the Coast of South America.

Mr. MOORE also exhibited a remarkably fine specimen of Tobacco Pipe Fish (*Fistularia*), collected and presented by Capt. Slack.

Messrs. Edmund Alleyne Cook, John Pownall Frost, and R. Everitt were unanimously elected Ordinary Members.

Mr. EDWARD R. RUSSELL then read a paper on "The *Autobiography* of John Stuart Mill."†

SEVENTH ORDINARY MEETING.

ROYAL INSTITUTION, January 26th, 1874.

ALBERT JULIUS MOTT, PRESIDENT, in the Chair.

Mr. JOHN NEWTON, M.R.C.S., exhibited an old Dutch Map of the British Isles, dated 1608. Mr. Picton was of opinion that the map was identical with one contained in Camden's *Britannia*.

* Darwin's *Journal of Researches into the Natural History and Geology of the Countries visited during the Voyage of H. M. S. Beagle round the World*, p. 239, edition 1852.

† See page 79.

Mr. PICTON then read a translation of the inscriptions on the Burmese Bell,* now in the Free Museum, which had been rendered by Mr. Gordon, a member of the Society.

Mr. JOSEPH BOULT then read a paper on "The Danish Intrusion into South Britain." †

EIGHTH ORDINARY MEETING.

ROYAL INSTITUTION, February 9th, 1874.

ALBERT JULIUS MOTT, PRESIDENT, in the Chair.

The PRESIDENT read a letter from Sir Samuel Baker, expressing his willingness to give the next Roscoe Lecture.

Mr. PICTON stated that he had observed among some bone dust at Birkenhead, recently brought from Alexandria, pieces of bone which had every appearance of being human remains. This dust was obtained from the catacombs of Egypt; and if his conjectures were true, it would appear that the remains of the subjects of the Pharaohs were thus being brought over to this country to fertilise the land.

Mr. E. DAVIES stated, that at one time he had analysed portions of three cargoes of this bone dust, and although he had found ancient bones, he could not say whether they were human or not.

The Rev. H. H. HIGGINS related some of his experiences on the Nile, and described his visits to the catacombs. The catacombs contain vast numbers of mummies of the ibis, of cats, and oxen, and the bone dust might very possibly be from the remains of these animals.

Mr. Peter Crook Marsden, and the Rev. Robert E. Guy, B.A., were unanimously elected Ordinary Members.

Mr. THOMAS WARD then read a Paper on "The Great Salt Deposits of Europe, with a theory as to their origin." †

* See page 269.

† See page 189.

‡ See page 168.

NINTH ORDINARY MEETING.

ROYAL INSTITUTION, February 28rd, 1874.

ALBERT JULIUS MOTT, PRESIDENT, in the Chair.

Ladies were present at this Meeting.

Mr. PRYON read the following communication on the *wich*, *sals* and *hals*, and other suffixes in the names of towns both in England and on the Continent, indicative of their connection with the Salt manufacture.

The names of places in England terminating in *wich*, being the site of salt works, and the prefix *Hall* under similar circumstances in Germany, open up an interesting inquiry as to their origin and relation.

We may first inquire, whether the termination *wich*, widely scattered as it is over the country, and applied to many hamlets and towns which never had anything to do with salt, can be shown to have any connexion with the manufacture. I believe there is such a connexion, but it is in an indirect and rather circuitous manner. The radical *wick* or *vic* is very widely spread throughout the Aryan languages. We find it in Sanskrit *ves'a* (the Sanskrit *s'* being the equivalent for the guttural in other tongues); Greek, *ῥίχος*; Lat., *vic-us*; Goth., *veih*; Gael, *fich*; Cym., *gwig*; A. S., *wic*; Norse, *vig*. The original meaning appears to be that of an abode or dwelling place. In this application we find *wick* or *wich* as a suffix in every part of the country; Barwick, Elwick, Warwick, Adwick, Osbaldwick, Kilnwick, Wickham, Wickford, &c.

When the Danish and Norwegian pirates ravaged the coasts of Great Britain, they ran into the little bays and creeks for shelter, and established themselves, sometimes temporarily, sometimes permanently. These *vigs* or hamlets

being usually in an inlet or bay, the term *vig* came to signify the bay as well as the hamlet. We have thus *wicks* and *vigs* all round our coast, Dunwich, Harwich, Sandwich, Northwich, Eastwick, Raywick, Berwick, &c. In Scotland Wigton, Wick, Uig bay in Lewis, Uig bay in the Isle of Skye, &c.

When many of these bays afterwards became used for the manufacture of salt from sea water, the term *vig*, *wick*, or *wych* was naturally associated with the place of the production. Subsequently when brine springs were discovered inland, the familiar name of *wych* identified with the salt manufacture was applied to them. The salt pans were called *wych* houses. In Domesday book we have references to salt works at Wich, Upewich, Middlewich, Norwich, Droitwich, all in Worcestershire. Hence, also Northwich, Middlewich, Nantwich, in Cheshire. Wick therefore, in a roundabout sort of way, has undoubtedly a philological connexion with the salt manufacture.

When the salt works became established inland, a difference was found to exist between the salt made from the brine springs and that from the sea water, the latter being coarser and stronger. From being made in the *vics* or bays on the coast it acquired the name of "bay salt," a term which is still continued in the trade, but more applicable at the present day to the salt made from sea water abroad.

Another element in the names of places connected with the Salt manufacture is *Hall*.

Sal and *Salz* are the terms for salt in the Latin and Teutonic languages, *Hals* and *Hall* in the Greek and Keltic. Now, it is a fact that we find the words *Hall* and *Salz* strangely mixed together, and intersecting each other in the names of places in Teutonic countries. *Halle*, in Prussia, stands on the river Saala; *Hallein*, in Salzburg, stands on the river Salza; *Reichen-hall*, in Bavaria, is on the river Sale; *Halstadt* is in the Salz Kammergut. We have in England

many names of places compounded with Hall. *Halsall*, in Lancashire, presents the same combination of the two elements just mentioned, and is situated on a marsh near the sea coast. At Haling, on the Hampshire coast, salt works still exist. We have also Halstead, Halwick, Halton, and others, all pointing in the same direction.

It is impossible to resist the conclusion, that in remote times, before the immigration of the Teutonic races into Germany and England, salt was manufactured in these localities by the Keltic inhabitants, who have recorded their memorials in the names left behind them. The Welsh name for salt is *hel*, and for a salt pit *heledd*. Hence *Prollhelli*, the salt pools. By the Welsh, Nantwich is called *heledd-wen*, the clear salt pits, Northwich *heledd-ddu*, the dark salt pits.

The light cast upon our local nomenclature and the migration of races, by associations of this kind, is interesting and worth being placed on record.

The Rev. W. KENNEDY-MOORE then read a Paper on "The Philosophy of the Fine Arts." *

TENTH ORDINARY MEETING.

ROYAL INSTITUTION, 9th March, 1874.

ALBERT JULIUS MOTT, PRESIDENT, in the Chair.

Ladies were present at this Meeting.

Mr. THOS. J. MOORE exhibited the following objects, from the recent additions to the Free Public Museum.

Specimens of the "pen" or style of a gigantic species of Sea-Pent† (*Pennatulidæ*), measuring eight feet in length, from

* See page 221.

† *Osteocella septentrionalis*, of Gray, *Annals and Mag. Nat. Hist.*, 1872, vol. ix., p. 406, and *Proceedings of the Zoological Society of London*, 1873, p. 780, pl. lxi.

British Columbia, presented by Messrs. Moody, Dietz and Nelson, per Mr. Coote M. Chambers. They were sent in fluid, with the soft parts intact, specially for the Museum, but unfortunately the "pens" only arrived in good condition. Much interest has been excited by these objects, as they are commonly known in British Columbia as fish spines. Various particulars were given to prove their real relationship, as above.

A fine specimen of *Astrophyton*, or "Basket Fish," attached to a coralline, fished up off Charleston, S. Carolina, and presented by Capt. Manterola, of the Spanish ship, "Concepcion," per Mr. T. Ibbetson.

The skull of the Gavial, or sharp-nosed Crocodile of the Ganges, presented by Mr. E. C. Elliston, who stated that the crocodile, when captured, measured twenty-three feet in length.

A cast of the fossil skull of the Tooth-billed Bird, from the London clay, lately described by Professor Owen under the name of *Odontopteryx toliapicus*, presented by the discoverer, Mr. B. M. Wright.

A living specimen of one of the large silk-producing Moths, of the genus *Saturnia*, which came out of chrysalis at the Prince's Landing Stage, and was presented by Mr. R. Mitchell, H. M. Customs, who received it from the "Great Britain," on her late return from Melbourne.

Mr. WALTHER exhibited some Japanese articles, and gave the following account of them :—

Some little time ago, a consignment of old metal was received from Japan, the bulk of which consisted of objects similar to these exhibited. The least damaged of these were selected, and handed about on 'Change amongst the young gentlemen there, who found them useful as cigar-ash trays. It will be seen that they possess a style of artistic merit, and are probably what they were reported to be, viz., mirrors

which were taken, during the revolutionary troubles, from some Japanese temple. They are circular in form, varying in size from about 2 inches to 6 inches in diameter. The reflecting surface is slightly convex, the curve being more pronounced in the smaller specimens, evidently for the purpose of reflecting the full face of the beholder. The metal varies from a coppery tint to white, and they are all, more or less, sonorous when struck, emitting a bell-like tone.

The reverse side is recessed and decorated with characteristic Japanese designs, scarcely two being found alike. In the centre of each is a boss, perforated with a hole laterally, through which a cord has been passed as a handle, or for suspension. This boss is generally modelled as a tortoise, and a peculiarity of the ornamentation is, that on every one, except some of the very small specimens, appear two birds kissing each other; generally, their bills meet at the mouth of the tortoise, so that the reptile appears to be a third party to the salute.

From this feature, a natural inference would be, that these objects were votive offerings on the occasion of a marriage, and the evidently diverse values of the objects might be accounted for by the different circumstances of the offerers, as the best of these mirrors are heavy and substantial, with very artistic designs, and there are all grades down to objects of a trumpery character, with one or two faintly embossed flowers on the reverse side.

Dr. EWING WHITTLE then read a Paper on "The Life and Times of Madame de Staäl, née de Launay."

An Extraordinary Meeting was held in St. George's Hall, on the 19th March, 1874. ALBERT JULIUS MOTT, President, in the Chair.

SIR SAMUEL BAKER delivered the Roscoe Lecture for

1874, on "The Past and Future of the Basin of the Nile." *

The Lecture was illustrated by the large map of Africa, belonging to the Royal Geographical Society, for the use of which a cordial vote of thanks was given to the Society, and also by other large maps of the Nile Region, belonging to the Lecturer.

ELEVENTH ORDINARY MEETING.

ROYAL INSTITUTION, March 28rd, 1874.

ALBERT JULIUS MOTT, PRESIDENT, in the Chair.

A communication was received from the Council, stating that Sir Samuel Baker had remitted £20 of the fee paid to him for the Roscoe Lecture, for the benefit of the Seamen's Orphanage, and that this amount had been paid to the Treasurer of that Institution.

Messrs. D. B. M'Culloch and W. Barclay were unanimously elected Ordinary Members.

Mr. JOHN NEWTON, M.R.C.S., then read a Paper, entitled—"Some new lights about Stonehenge and the Early Britons; a contribution to the History of Ancient Faiths."

TWELFTH ORDINARY MEETING.

ROYAL INSTITUTION, April 6th, 1874.

ALBERT JULIUS MOTT, PRESIDENT, in the Chair.

Ladies were present at this Meeting.

A communication was received from the Council, recommending Professors Alexander Agassiz and Max Müller and

* See page 141.

Sir Samuel Baker for election as Honorary Members, and the following gentlemen as Corresponding Members: Samuel Archer, Esq., Surgeon-Major, Honduras; Samuel Booker, Esq., Georgetown, Demerara; and Coote M. Chambers, Esq., Burrard's Inlet, British Columbia.

Mr. JOHN DODD was unanimously elected an Ordinary Member.

Mr. Consul HUTCHINSON then read a Paper on "Some Fallacies about the Incas of Peru." *

THIRTEENTH ORDINARY MEETING.

ROYAL INSTITUTION, April 20th, 1874.

ALBERT JULIUS MOTT, PRESIDENT, in the Chair.

Ladies were present at this Meeting.

The PRESIDENT read the following brief Address:—

We close, to-night, the Sixty-third Session of this Society, and it is gratifying to notice, that our numbers are larger than at any former period, and that the average attendance at our Meetings has not been equalled in any previous year. This has been due mainly to two causes, and they suggest two practical questions of great importance, which, as they require very careful consideration, I shall take this opportunity of bringing before you, that they may be thought of during our vacation.

We have had fourteen Meetings this Session, and have invited ladies to ten of them; a wholly unprecedented occurrence. The invitations have been justified by the attendance; the number of ladies who now take an interest in all the objects of learned societies is considerable, and is certain to

* See page 121.

increase rapidly, and the time seems to have arrived when this change should be recognised by some more definite arrangements as to the position they hold among us. Ladies were for the first time invited to one of our meetings on the 17th of November, 1862, under a new bye-law which had just been passed. That they should join us as far as can be done conveniently, either as guests or members, must be desirable, especially as to those who receive the best education of the present day; and I recommend the matter to your thoughts, not for hasty action, for we are doing very well at present, but for consideration at leisure. If the married men will consult their wives, and the unmarried their sisters, we shall get the combined wisdom of both sexes to guide us in our future plans.

The second cause of increased activity amongst us is doubtless to be found in the growth of scientific knowledge, and of the interest which accompanies it: the desire to explore all the realms of nature, and to learn the truth in every direction, was never stronger, and it is on one of the practical results of this that I wish to say a few words. Exact knowledge being the only sound foundation for general inferences, systematic observation and experiment being the only roads to exact knowledge, and the difficulty of obtaining these with precision and in combination by purely voluntary agency being doubtless great, the more ardent, and on that account the less patient lovers of science, are anxious to call in the direct help of Government, and to make the pursuit of their favourite studies an affair of State. The example of other countries is appealed to, and it is said that if we do not follow it we shall be left behind in the race. These views are very strongly represented now, and will doubtless be urged upon our Government, and it is most important that sound opinions concerning them should prevail among our learned societies.

Now, I am far from thinking that Government, in England, should do nothing in aid of science; but I believe it would be a very grave mistake if we ever came to look to the State as the chief promoter and organiser of our scientific pursuits. There is no abstract truth concerning the relations of governments to the higher studies of mankind. It is not a question of principle, but of circumstance. Because certain methods work well in Germany, it does not follow that they would do so here. Nay, it must be assumed that they would, at least, work differently, for the habits of the two nations, whether public or private, are not the same. Nor will their scientific products be the same under any circumstances, and nothing is more important than to remember this when comparisons are made. If we envy Germany her precise and patient work, her passionless intellect, and the leisure of her learned men, we must recollect that our own gifts and opportunities are not of less value because they are of a different order, and that their final results leave us no reason for dissatisfaction. Science in England has grown up, like most other things, with little apparent method, but with an actual progress as great as the world has ever seen. The system of the universe is known by the name of one Englishman; the mechanical equivalent of heat by the initial of another. The history of the ancient world is in the British Museum, and the grave of the only explorer whose body was ever brought from Central Africa to Europe is in Westminster Abbey.

As President of a Society now more than sixty years old, I naturally feel how great is the vitality of English voluntary associations. I feel also how necessary it is to restrain the impatience of scientific zeal, as well as to accept and utilise the impulse it gives to learning. If you wish for an oak tree where you have only an acorn, it is certain that you may have

your tree, but equally so that you must be content to wait fifty years. So with the pursuit of knowledge; the thirst for it, however intense, cannot be quenched at once, for Time is the universal cup-bearer. He brings the waters to those who have deserved them, but never in haste, and never the sooner because we chafe at his delay.

The reasons for and against dependence on the State in these matters are, of course, very numerous. I do not attempt to discuss the question in detail, but as one side of it is certain to be warmly urged, I commend the other side to your attention, as a parting word at the close of our Session.

A communication was received from the Council, recommending Mr. E. C. Reed, of the Museo Nacional, Santiago de Chili, for election as a Corresponding Member.

Professors Alexander Agassiz and Max Müller, and Sir Samuel Baker, recommended at the last Meeting for election as Honorary Members; and Samuel Archer, Esq., Surgeon-Major, Honduras; Samuel Booker, Esq., Georgetown, Demerara; and Coote M. Chambers, Esq., Burrard's Inlet, British Columbia, as Corresponding Members, were unanimously elected.

Mr. Robert A. English, and the Revs. T. Snow, M.A., — Barton, M.A., and T. Kearney, were unanimously elected Ordinary Members.

Dr. BAILEY exhibited some specimens of Amber (supposed) containing Spiders, from Zanzibar, brought in the "Malwa," the same vessel which brought the remains of Dr. Livingstone to England.

The Rev. E. M. GELDART then read a Paper on "The Antiquities of Modern Greek." *

* See page 275.

OPENING ADDRESS.

By ALBERT J. MOTT, President.

MODERN Science, while continually establishing the reign of Law, by which we mean the Permanence of Causes, has taken a special view concerning the continuity of their Effects.

Instead of supposing that similar effects are repeated, though with infinite variety in their arrangement, it supposes that the same causes produce from age to age effects which are not similar, but which alter in a certain order called Progress or Evolution.

The two hypotheses have much that is common to both; for permanent causes necessarily produce effects in an orderly series, and infinite variety precludes the exact repetition of precisely the same thing; but there is a radical difference between them which is of the highest consequence to philosophy.

The first hypothesis represents the universe as always essentially the same, and as capable of continuing so for ever; the other treats it as subject to positive changes which are steps towards a final consummation.

The last is the philosophy of the Finite, the first of the Infinite, and they naturally lead us by well-known paths, the one to Materialism, the other to Immaterialism.

Without tracing their results to these ultimate and momentous issues, we may notice two opposite modes of thought, two different kinds of expectation, in our treatment of the higher problems of science, which grow from these philosophic roots.

The evolutionist, in seeking the history and origin of what he finds to-day, looks back into the distant past, expecting always to find something very different. Instead of the starry heavens, he imagines a period when there was nothing but vapour in the abyss of space. Instead of land and sea, summer and winter, seed-time and harvest, he thinks of a glowing and molten world, uninhabitable. Instead of trees, insects, birds and beasts, he conceives a time when the only form of life was perhaps a shapeless jelly.

In contrast with this, another, and I think a higher philosophy supposes that the past has been essentially like the present, and that at all events this is probably true within the utmost limits of human contemplation. It sees in the known universe an inexpressible grandeur and glory, and yet feels that, man's knowledge of it being finite, all that he beholds in it shrinks into a point without dimensions, when compared with all that lies beyond. It feels that this is true in time as well as space, and that to suppose ourselves to have any knowledge of a period sufficiently distant for universal changes to be probable within it, is as unwise as to expect the moon's course to alter after a single revolution. Not single revolutions even of any cosmical whole, but only the merest fractions of unknown orbits are all that come before us, even in our most daring dreams, and the nearest approach to any escape from this limitation, the great doctrine of the Dissipation of Energy, is seen on reflection to be as limited as all other human views; for this doctrine is only true in practice as an exposition of what must occur in a system which is really finite. If there is no such system, the predicted result will never happen, though the predicted processes may always be going on.

The sober and contemplative view of natural events

which accords with these considerations has already been adopted to a great extent in the study of Geology. We no longer fancy that great catastrophes, and forces more powerful than those of our own time, were necessary for the formation and upheaval of the existing rocks. We do not want a boiling sea to wear away the granite, or an atmosphere of carbonic acid to account for the coal-fields, or even a molten earth to flatten the poles. Every new discovery tends to show a closer resemblance between terrestrial conditions in the oldest geological epochs and at the present day. We understand how great geographical changes may result from small movements of the crust, or even from the slow filling up of oceans; how changes of climate may follow, and with them changes of deposition, of denudation, and of the distribution of life. We know that volcanic action occurs in all parts of the earth, and is sufficient to melt any given quantity of rock within a calculable time.

As to life itself, the reasons which led to the belief that the chief orders of living things began to exist in succession within the period of which the rocks bear record, are being gradually removed. Particular groups have doubtless appeared and vanished, but it is not possible to say of any known epoch that either beasts, birds, fishes, or insects had no living representatives at that time. It becomes more and more certain, that if we wish to understand the former history of the world, the safest plan is to assume that it was, at any period to which we are likely to trace it, very much the same sort of world as we find it now.

I believe the time has come when this important principle of human research may be applied to the history of the human race itself; and since this is not yet admitted, while questions concerning the origin of mankind have

become either the radiating or the culminating points in most branches of science, the subject is especially worth our attention at the opening of a new session. Whether you accept the views I lay before you or not, the ground we must go over is full of interest, which increases every year.

In speaking of the Antiquity of Man a year ago, I gave some general, and for the most part theoretical, reasons for dissenting from the belief that the world was once peopled only by savages of whom we and the rest of mankind are the developed and improved descendants. To-night I propose to deal less with theory, and more with the actual evidence bearing on this subject. I hope to satisfy you that, instead of looking back to a period of universal barbarism, our most distant glimpses are still of a world peopled as now with men both civilised and savage ; that the rise and fall of races, and the vicissitudes of national greatness, have probably been going on continuously from the remotest times of which we have any natural record ; that the facts already known to us can be fully explained on this hypothesis, but not on any other ; and that they give us at present no information as to any previous state of human existence, or concerning the origin or first appearance of men.

To establish this will not be to refute any existing theory on the subject, provided only that it allows the date of man's origin to be put back indefinitely in time. It will be open to you to attribute that origin to a creative act, or a primeval germ, or any other efficient cause, the argument going only to show that, so far as natural evidence is concerned, we have found nothing yet which throws any real light upon that part of the question.

It must, I know, try the patience of confirmed evolutionists to consider the matter from this point of view. The

habit of thinking that all things may be traced to their beginning has grown so fast upon us that the old conception of stability and permanency in nature has to a great extent disappeared. The vast extension of the field of scientific vision which has really occurred, has led to an exaggerated view of its comparative value, and we have great need to be reminded that the longest sounding line never drops below the surface when the depth is infinite. It is not long since it was supposed that the present series of rocks was the original series, anything before it being chaos, or fluid matter; and it is curious to notice how, even now, the whole history of the world in its present condition is looked for in this series. Yet we know that the processes by which such rocks are formed are all going on at present, and that the whole series may have been repeated again and again for any number of times, and that there is no reason whatever for supposing that we stand either on the first or the last of these monumental piles of strata, each of which in turn either crumbles above or melts below, and so vanishes after a certain age.

I am only maintaining that what is thus true of the earth itself is true also of its inhabitants, and of man among the rest.

The study of pre-historic times is in itself so new, and the questions affected by it are so important, that preconceived opinions concerning them cannot be immediately shaken off, and we have to wait a little before the true bearings of the evidence are fully seen. That evidence grows upon us day by day, but the inferences drawn from it are all seriously affected by one assumption, which appears to be universally made, but which I believe it is necessary to abandon. It is assumed that in considering the origin of the existing families of men we must accept one of two alternatives, and must suppose that either there was one

original race of the highest type, from which the lower tribes have degenerated, or else one original race of the lowest type, from which the higher tribes have been developed.

Now, apart from theological teachings, there is no evidence anywhere concerning any original race of either kind. No ethnologist thinks of taking any living tribe of men as the unaltered lineal descendants of any such first family. Everyone admits that an original race, if in fact there was one, must have been split up into many distinct races long before the characteristics of existing tribes were fixed, and that no human family shows us now what the first family must have been.

This being the case, I wish you to consider whether it is not surely wise to set aside the speculative assumption, and to suppose it probable that high and low races, civilised and savage men, have coexisted in former ages for an unknown length of time, and that the condition of mankind as now existing must be accounted for by the action of these various elements, within themselves and upon each other. As a sound geologist no longer allows his doctrines to rest on any assumption concerning the beginning of the world, so I advise you to discard from the scientific study of humanity the idea that you can build anything of value on any theory about the origin of man. It is the history of men, and not the genesis of human nature, that is the field really open to our inquiry.

I shall proceed at once to some practical illustrations in support of this view.

Easter Island stands alone in the Pacific Ocean, two thousand miles from South America, and about one thousand from the nearest islands that are habitable. It is about twelve miles long by four in width; not so large as Jersey. The inhabitants, about a thousand in number, are savages.

They are, of course, entirely isolated, and the island is seldom visited by ships. It is volcanic, and the soil fertile, but it could not maintain a population of ten thousand souls without the aid of civilisation or foreign intercourse. Probably the natives have never reached half that number in their present condition of life.

This island is strewn with hundreds of carved stone images, many of them of extraordinary size. Some are nearly forty feet long. Many are over fifteen feet. Two of the smaller ones are in the British Museum. One of these is eight feet high, and weighs four tons. Many of these images have had separate stone crowns placed upon their heads, the crowns being from two to ten feet across. Thirty of these crowns were found on the hill from the rock of which they were sculptured, waiting to be removed. The images were generally set on pedestals, upon raised terraces, of which there are many. The terraces are about a hundred yards long, ten yards wide, and on one side—they stand on slopes—seven or eight yards high. They are built of large stones, some of them six feet long. There are also remains of numerous low stone houses and other structures in the island. The present inhabitants know nothing about the origin of these things.*

How are the facts to be explained? How, and by whom, has Easter Island been peopled, and what is the real history of its inhabitants?

The question is deeply interesting. Most islands naturally habitable have been found with native tribes upon them, ignorant of their own origin. The common theory is that islands generally have been peopled by accident.

Savages, in canoes only, and with no compasses, cannot

* Palmer, *Journal Royal Geographical Society*, January, 1870. *Proceedings Royal Geographical Society*, vol. xiv., p. 108.

make intentional voyages across the open sea, but it is supposed that the occasional drifting of their boats by storms and currents has in the course of ages thrown human life upon every shore.

I do not think the explanation is a sound one. We have to remember that besides the accident itself four concurrent circumstances are absolutely essential. Both sexes must be thrown together on the island. They must be of such ages as to become parents there. Children of both sexes must be born to them, and both must survive together till they are grown up.

Now the chances of the original accident are extremely small. Such events no doubt happen among groups of islands not far apart, but when the distance is such that a canoe must be many days and nights upon the ocean, and generally, on the supposition, upon the stormy ocean, while there is no natural reason why it should touch any land at all till it comes across a continent, the cases of survival and successful landing must be rare indeed.

Considering the average speed and continuity of oceanic currents, and the average effect of wind, it can seldom be possible for anything floating on the sea to drift a thousand miles in any one direction in less than a month. But a week in an open boat involves great suffering and danger, and a week without food is fatal, and the want of water is certain to be so in any voyage of this kind, unless it has been purposely provided against.

There is no reason to think that savages at present are ever carried to very distant islands in this way. We do not hear of their arrival thus in New Zealand, or Mauritius, or Seychelles, and when the conditions necessary to the founding of a race are added to the necessities of the case, the whole improbability becomes too great for reasonable belief.

This view is confirmed by the general Fauna of islands. The animals found in them are usually only such as would naturally arrive from time to time by that very process of drifting which will not account for the arrival of human beings. We see in them what this process will really do. Driftwood is borne into the sea by almost every river in the world, and the chance of its arrival at any given spot is many million times greater than that of the drifting of a canoe to the same place. Yet it suffices only to carry small animals who can survive upon it for a considerable time. The advent of new comers at various intervals is doubtless continuous, and changes in the fauna of islands may be accounted for by this means.

Moreover, we ourselves are well acquainted with the mode in which islands are peopled with human inhabitants now-a-days. It is not by the drifting of boats, but by the intentional settlement of colonists. Maritime nations are always finding out those uninhabited or thinly peopled spots which offer inducements to settlers, and settlers go there in sufficient number and with the requisite means for permanent occupation. Nothing appears more natural, and no other explanation would be needed if it were not for two preconceived opinions which have prevented us from accepting it. We take for granted, in the first place, that there have been no maritime nations in ancient days who were able to cross the seas at will ; and, in the second place, that if islands generally had been peopled in this way they would not now be found, as we have found them, inhabited by savages.

Both these preconceptions are, I think, disproved by conclusive evidence, and I choose the case of Easter Island to illustrate the nature of the disproof, not because it is different in kind from hundreds of other cases, but because

the facts are in this instance particularly striking, and the inferences, I believe, unavoidable.

If this island was first peopled by the accidental drifting of a canoe, it is incredible that the art of making these images and terraces should have been self developed there. It would be two or three centuries before there could be physical strength enough to do the work, so that any original idea about it, even if possessed by the first comers, would have been long forgotten. When the people were sufficiently numerous to move such masses of stone, the struggle for subsistence in so small a space would have become severe ; and to suppose that savages, under such circumstances, would spend their time and strength upon labours of this kind is altogether past belief. That there should be any motive for doing so ; any conception of giant forms, with crowns upon their heads, originating in a tiny island cut off from all outward influences, is equally inconceivable.

The only rational explanation is the very obvious one, that at some distant period the island was intentionally colonised by some nation accustomed to naval enterprise ; and that the images were carved there in accordance with previous habits, or because suitable materials were at hand, and in either case because the ideas of such things, and the skill to make them, were already possessed by the colonists.

While the parent nation flourished, the colony would continue to have intercourse with it, and would in consequence be able to maintain a close population.

But whatever that nation may have been, we know that it must have vanished as a maritime power long ago. When this occurred, Easter Island would become as we have found it, a spot entirely cut off from the rest of the world. If at first there was timber enough on it to build ships, this would

soon be exhausted, and the power of crossing the sea would finally cease.

Probably the best of its inhabitants would leave it in the early stages of national decay, and the gradual degradation of the rest would I think be inevitable, whatever the race might be. It would be so from the aggressive nature of the influences tending to that result, and the failure of that external help by which they may be resisted.

The ease with which power could be seized and held by unscrupulous individuals; the growth of idleness and self-indulgence, where there was so little motive for exertion, or self-restraint; the depressing effect of the loss of former interests, and the shutting up of life upon itself; the physical effects of long continued intermarriage in the same small stock; of epidemic disease; and of occasional famine; all these agencies would be at work together, with nothing to counterbalance them, and I do not think any race in the world could resist them for many generations.

As a matter of fact, it is clear that the Easter Island people are inferior to their ancestors. The island, now left chiefly to nature, bears the marks, as might be expected, of having been fully cultivated in former days. The people, also as might be expected, are clever in carving, but they make nothing of any size. They have a king, and priests, and sacrifices and festivals, but they have no history. They are said to have a tradition that their ancestors came from Oparo, a small island nearly two thousand miles off. But they have, of course, no means of identifying such an island at such a distance, and the story, which comes I believe through the Jesuit missionaries, is clearly a misunderstanding of some kind. The people are nearly white in colour, and are not idolaters. Their language is considered Polynesian, but nothing is determined by it.

Everything known about them accords with the theory I

have suggested; the theory, namely, of former colonisation and subsequent decay.

Now, a single case of this kind seems to me as conclusive in its nature as the finding of a single bone in a particular strata. The fact involves certain inferences which can only be avoided by supposing that something has happened which is not in the usual course of natural events. These inferences in the present instance are, first, that some nation, able to navigate the Pacific, and to found colonies there, has existed in some former age; secondly, that its history is lost, notwithstanding the degree of civilisation which it must have possessed; and thirdly, that the descendants of the colonists have degenerated into ordinary savages.

I think these would be necessary inferences even if Easter Island stood alone as evidence, but abundant confirmation is quickly found if we look about in the light of this theory.

Similar terraces and images have been seen in other islands now uninhabited. The ruins of ancient stone buildings of great extent are found in the Phillipine Islands, the Ladrones, the Marshall and Gilbert groups; the Society Islands, the Navigators, and the Marquesas. They thus extend over ten thousand miles of ocean. Scarcely any one has looked for these remains. Our slight knowledge of them is accidental, and there is little doubt that they are far more numerous than this would lead us to suppose. The only attempt at a systematic exploration of the Pacific Islands is at present carried on by a firm of private merchants, the Messrs. Godeffroy of Hamburg. They are publishing the result of their inquiries, which are likely to be of great value. I should be very glad if I could say that any similar work had its origin in Liverpool. In default of any other explanation, it was at first conjectured that some of the

structures found in these islands, were the work of buccaneers in the seventeenth century, but their size and character show this to be impossible. We are totally ignorant as to their age or origin; but it is stated that in Maldon Island, stone terraces have been discovered under beds of guano, which would, of course, be proof of great antiquity.

The Malays, in the thirteenth and fourteenth centuries, were skilful navigators for that period, but there are no grounds for attributing these works to them, or for supposing that they ever reached the more distant islands. Nor is the question of date or race important to my purpose, as I shall have occasion to show.

The evidence concerning the peopling of islands has special points of interest and value, but I shall now call your attention to another series of discoveries by which the production of savage life, not as the precursor, but as the successor of civilisation is exhibited on the grandest continental scale.

It is about thirty years since Mr. Stephens published his account of the ruined cities of Central America, and four years later the researches of Squier and Davis among the mounds of the United States, were made known in the splendid volume issued by the Smithsonian Institute. Both these works excited great interest and much debate, but they appeared too soon for the true bearing of the facts to be in the least degree appreciated. At that time our ideas of human history were founded on complete ignorance as to the antiquity of the human race; and when it was made clear that superior races had lived in America long ago, the questions suggested were as to what nation in the old world they could have sprung from, and whether their culture was derived from India, Egypt, or the Jews. Mr. Stephens disappointed the archæologists, by stating his own opinion that the culture of which he found the proofs in the ruins of

Palenque, and other Central American remains, was native to the country, was possessed by the ancestors of the present inhabitants, and was probably not ancient in any extraordinary sense. This was a sound conclusion, of far greater importance than Mr. Stephens himself could be aware of. But the facts concerning Central America are complicated by the Spanish conquest and the unsatisfactory nature of the accounts concerning it; for the Spaniards were neither good observers nor good witnesses; and I shall therefore pass them over, and ask you to consider the much simpler evidence of the North American mounds.

This evidence has been elaborately described by Dr. Wilson in his work on *Pre-historic Man*, published ten years ago. Sir John Lubbock has devoted a chapter to the subject in his *Pre-historic Times*. An excellent account of the objects found in the mounds is given by Mr. E. T. Stevens, of Salisbury, in his volume on *Flint Chips*; unfortunately already scarce. The facts are fully admitted, but the question is, what we ought to infer from them, and I shall have briefly to state many of them over again, in order to point out what I conceive to be their real and most important bearing. The relics from the mounds moreover are now in England, and are accessible to all. They form the most interesting feature in the Blackmore Museum at Salisbury; a model museum of pre-historic archæology. They are, I think, among the most valuable relics which the past has left us, and they are absolutely unique; nothing in the least like them having been found elsewhere.

The whole of North America, from the Gulf of Mexico to Canada, is full of ancient works of earth and stone, chiefly found in the form of mounds and embankments. They exist in countless thousands, and I believe in every State; but the most remarkable are in the great plain or valley between the Alleghanies and the Rocky Mountains, a district at least a

thousand miles square.* Some lines of embankment are thirty feet high. Many areas inclosed by them are from one to two hundred acres; some are double this size. One group of works contains twenty miles of embankment. One of the mounds is one thousand feet in circumference, and seventy feet high. Another is two thousand feet round the base, and ninety feet high; a truncated pyramid, with a flat top of several acres. Many of the inclosures are in the form of circles and squares, and in many cases these figures are mathematically exact, notwithstanding their great size. In one of these exact squares each side is a thousand and eighty feet long, and the area inclosed twenty-seven acres. In one of the exact circles the diameter is seventeen hundred feet, the area forty acres. The precision of these figures has been ascertained by mathematical survey. The ellipse, also exact, is found in other cases.

One work has the remains of more than two miles of stone wall, containing nearly a million cubic feet of stone. In another, there are three million cubic feet of earthwork.

Many of these have clearly been defensive works. Others are supposed to have been sacred inclosures. The mounds themselves are divided by Messrs. Squier and Davis into sacrificial mounds, mounds of sepulture, temple mounds, and anomalous mounds. This, of course, being more or less conjectural.

The number and magnitude of these works, and the vast extent of country over which they are spread, show at once that North America has been inhabited by a very numerous people. That they were an agricultural people follows, of course; and marks of ancient cultivation are really found. That they understood the general principles of geometry and engineering is proved by the exactness of their work. Neither

* *Smithsonian Contributions*, vol. i., pp. 4, 8, 56, 66.

a true circle, with a radius of eight hundred and fifty feet, nor a true square, with a side of a thousand and eighty feet, can be drawn on open ground by any one without the help of exact measures and mathematical knowledge. And the wish to make these figures true, when on a scale in which the eye could not detect a considerable inaccuracy, is a much stronger proof of habitual skill than even the ability to do the work. I shall ask you particularly to weigh the force of this consideration. I do not think it has been dwelt upon as it deserves.

These conclusions, which are unavoidable from the first, are borne out in the most perfect manner by every successive step in the examination of the evidence. The way to test a theory is to consider what ought to follow from it, and then to ascertain whether this is true in fact. Now if the Red Indians could not be the makers of these works, while nevertheless they were the only inhabitants four centuries ago, the works themselves must be very much more than four centuries old. We find immediately that this is true. Many of these mounds and embankments are overgrown with what we are accustomed to call primeval forest. The age of the trees standing on them, as determined by the annual rings of growth, is at least five or six hundred years in many cases; and as there is no ground for believing these to be the first trees that ever grew there, the probable age of the works is thrown back for an indefinite time.

Further proof of antiquity is discovered when the mounds are examined internally. Many and most remarkable objects are found in them; but wood has nearly always disappeared, and bones are in a condition of great decay.

A numerous people spread over a wide empire must have had easy means of internal communication. We see, accordingly, from the objects found in the mounds, that

they possessed copper in abundance, which came, doubtless, from the shores of Lake Superior, where the ancient mines have been re-discovered ; obsidian, which is not found nearer than Mexico ; mica, probably from South Carolina ; pearls, and marine shells. And among the sculptured objects from Ohio are exact representations of the Toucan, which belongs to tropical South America, and the Manatee, found on the coast of Florida.

Our natural expectations are thus successively confirmed when we look into the details of this remarkable evidence, and the confirmation is conclusive when we come to the proofs of real culture and refinement furnished by the relics from these mounds.

The objects of the greatest interest are the sculptured stone tobacco pipes ; the oldest known tobacco pipes in the world, most of which were found in the same mound in Ohio.

These pipes are unique in form, and are carved out of hard ornamental stone in which their bowls are hollowed and their tubes drilled with perfect skill, and the bowls themselves are sculptured into the forms of birds, animals, and human heads, in a manner quite unapproachable by any but civilised races. It is necessary to see these pipes to appreciate the force of their silent testimony, and in the Salisbury Museum, where they are seen in contrast with the works of the present Indians and other savage tribes, the evidence is at once conclusive. They are works of art of a high order ; true to nature and exquisite in finish. They are the products of taste, leisure, and refinement in a cultivated and prosperous nation.

Four representations of human heads were found among these sculptures. Three of the originals and a cast of the fourth are in the Blackmore collection. In general character they have been said to resemble the present American type ;

but, as a matter of fact, they differ from each other as widely as possible in feature and expression. Two of the faces are marked with lines which might denote paint or tattooing. Two are without these marks. They are admirably carved. They look like portraits of individuals. They may, of course, represent foreign heads, and not the race of the sculptors; but they are heads that might belong to the best races in the world. One of these, it is important to notice, is not part of a tobacco pipe.

Pipes and tobacco were unknown to the old world before the discovery of America, where the early explorers found them in common use. The practice of smoking furnishes the most striking example on record of a custom, apparently originating among savages, and an instrument, apparently invented by them, which are yet proved to have been derived from higher races, and to have reached their existing form by a process of degeneration. It ought to shake our confidence in all those lines of reasoning which assume that the rudest form in which any implement is found is the earliest in the order of invention. The North American Indians must have inherited the art of making and using tobacco-pipes from the ancient mound builders; but the very shape of their early models had been forgotten, and these beautiful objects of real artistic luxury had given place to the rude pipes of savages.

I myself know nothing of the pleasure of smoking, and I am not prepared to say whether mankind are the better or the worse for it; but I believe it is one of those customs which could not have originated among savages. The invention of the tobacco-pipe, simple as it is, requires a knowledge of the method and the effects of inhalation, which cannot be accounted for by the traditional idea of a

savage, sitting by his forest fire, into which the leaves of wild tobacco have been accidentally thrown.

The other objects from the mounds confirm every inference drawn from the sculpture. Disks of mica, exactly circular, and cut by a sharp-edged tool; curved ornaments of the same material; borings which could only be made by metallic instruments; elliptical borings; copper tools and delicate work in the same metal; a profusion of pearls; a stone tube, of peculiar form and unknown use, thirteen inches long, drilled through its entire length in the most perfect manner, and cut with exquisite finish, are all proofs of superior skill and knowledge.

Other peculiarities separate the Mound Builders both in time and habits from the present races. The relics have been found chiefly in mounds called sacrificial, from their internal evidence. Under the middle of these mounds, at about the level of the ground they stand on, are certain basin-shaped structures, supposed to be altars, generally made of very hard baked clay, varying in shape in different mounds, and from two to fifty feet in length. The ashes and sometimes the bones of what would seem to have been burnt offerings are found upon these altars, with the other relics. Layers of mica, in thin plates, sometimes occur under or over the objects, some of which are found wrapped up in it or in sheet copper, perhaps to preserve them from the fire. The mounds themselves have been raised over these so-called altars. They are usually two or three yards high, and twenty or thirty yards diameter; not always round. One is nearly fifty yards by twenty; another is about six yards high. They are formed of earth, with one or more thin layers of sand introduced, and are covered at the top with a layer of gravel, generally about a foot thick.

The reasons for thus burying an altar are not obvious ; possibly the rites performed upon it may have been rites of dedication ; the mound itself being used for some special purpose, or else raised as a foundation for some edifice or monument. In this case the objects placed upon the altars would be analogous to those we ourselves lay under foundation stones, and the sand and gravel might be intended to drain off moisture. These altar mounds are supposed by Sir John Lubbock to have been burial places, notwithstanding the objections to this view which are fully given by Mr. Squier ; but in either case they are unlike anything found elsewhere, and they clearly establish therefore the existence of an ancient race whose manner of life has been forgotten.

The actual age of these structures is quite unknown. There is nothing to show that they are older than other monuments in Europe and Asia, and they have therefore no direct bearing on the question of the antiquity of the human race. Nor do they help us to any knowledge of the way in which America was peopled, or to the ancestry of the race who made them.

But, as I have already suggested in speaking of Easter Island, these questions, although a great deal of discussion has been spent upon them, and they can never lose their interest, are not the questions most important to us just now. For archæology is assuming that there was a time when all men were savages ; that civilised life is the product of savage life, unassisted by anything but acquired experience and fortunate circumstance ; that existing savages are in general the undeveloped remains of humanity in its early stages ; that still lower, because earlier, conditions are therefore possible, and that thus the development of men from ascidians or from monads, is consistent with the general history of mankind ; and, of course, that this

theory is our true guide in examining the relics of former times.

I think the American discoveries, properly understood, cut away the whole ground on which this reasoning is founded.

The North American Indians, when the continent first became known to us, were typical savages in every way. They were neither the lowest nor the highest, nor were they all alike ; but if the modern theory is true, they were in one of those stages of development through which all civilised nations must have passed on their way to something higher. Yet these Indians, instead of springing from some lower state like that of the Australians, are proved to be the successors of a people in every respect much higher than themselves. They are proved also to be their descendants as well as their successors, because one at least of the most striking customs of the ancient race has been inherited, and because it is impossible to suppose that so numerous and cultivated a people could themselves become extinct, or that they could be exterminated by any immigrant tribes in the condition of the Indians. These savages, therefore, have reached their present state by degradation, and not by progress. Their rude arts are not their own invention, but are derived from higher art, become barbarous in their hands. No single custom found amongst them can be identified as of savage origin, for their former customs were of course those of their more civilised ancestors, and it is these as altered by barbarism that we find among them now.

But if this is the case over an entire continent, what becomes of the idea that savage life in general is an example of arrested progress, and not an example of retrogression ? If we come to a portion of the world twice as large as Europe, entirely abandoned to nature, and peopled only by

wild hunting tribes, with nothing about them to suggest their descent from any races higher than their own ; and if we find, nevertheless, that this vast continent was once well filled by the people who built the mounds ; on what ground are we to assume in any other case that the existence of savages is any evidence against the previous occupation of the same district by civilised men ?

It is clearly proved that if the whole world was at some former time at least as civilised as the mound builders, all the known facts concerning savage life may still without difficulty be accounted for.

Nothing, I think, can be more striking than the fact that Easter Island and North America both give the same testimony as to the origin of the savage life found in them. The contrast between them in size, position, and capability—in all the chances of accident, and all the causes of change—is as great as can be conceived. Yet it is certain in both cases that the present savage state is not the former state of their inhabitants. We could have known nothing about this in Easter Island if no stone monuments had been left there ; or in the United States, if there had been no mounds, or even no relics in them. Clearly it is very easy for the records of a great nation's life entirely to perish, or to be hidden from after observation. Consider how Nineveh and Babylon were forgotten only a generation ago, and how we have but just discovered the facts concerning America.

I shall venture to predict that sooner or later relics of former civilisation will be found in Australia ; believing it almost incredible that any race in the condition of the so-called aborigines could have colonised the country. Very recent intelligence concerning New Guinea shows us that the ethnology of that part of the world is not understood ;

and whenever proper search is made we may look for very interesting discoveries.

The actual degree of civilisation possessed by the old Americans is of course only a matter of conjecture. On the one hand, no idols have been found, which, among a people so skilled in sculpture, may be looked upon as probable evidence of high religious ideas. On the other hand, there are no traces of writing of any kind. The evidence in either case is purely negative, however, and nothing can properly be built upon it. There is some reason to think that human sacrifices were offered, while it is not likely that a people whose measures were so accurate had nothing but memory to rely upon.

I think, indeed, we ought to take for granted that no nation much above the savage state has ever been without the means of recording its ideas, and that apparent evidence to the contrary should be distrusted. It is stated, for example, in all the usual accounts of Peru, that the Peruvians, when first discovered, were entirely ignorant of any sort of writing, and had no better record than the quipu of knotted strings.* But Dr. Wilson has pointed out that this is an error, as should I think have been suspected from the first. And we should pause before we assent to the assumption that phonetic writing like our own necessarily implies a higher state of culture than writing of any other kind.

In speech, all men express ideas directly, associating them with uttered sounds. In phonetic writing, we express the same ideas indirectly, the letters suggesting the sounds, and the sounds the meaning. This, however, is chiefly true in theory only, for although the written letters do enable us to ascertain the sounds intended to be expressed, we habitu-

* Wilson, vol. ii., p. 146.

ally look at every familiar written word as an entire symbol by which the word is at once conveyed to us, without reference to its component parts.

But if the letters M A N stand thus for the word expressing the idea of man, independently of their separate phonetic force, they have no advantage over any other symbol conveying the same meaning. Nay, they are at a certain disadvantage, because the idea of man is the same thing to everyone, while the uttered sound expressing the idea is not so. An Englishman who calls a man a "mon" might be puzzled by the written word composed of letters. He could not be puzzled by a symbol which was independent of determinate sound.

An alphabet is a grand instrument, and its powers have been wonderfully exercised, but it may well be doubted whether the language of thought cannot be even better expressed by symbols of some other kind; and it must, I think, be certain that this will depend largely on the structure of the spoken language, and the forms of thought which have become habitual. Those astronomical and other symbols which Mr. Tylor regards as survivals of the rudest form of writing,* are nevertheless retained and multiplied by the deliberate choice of modern science, for the double reason that they abbreviate the record, and that they can be universally understood, whatever the spoken language of the reader may be.

We cannot leave out of account the fact that in China, where the knowledge of reading and writing was universal when it was quite exceptional in Europe, and where the number of people who possess that knowledge is immensely greater than in any other part of the world of the same extent, the basis of the writing is not phonetic. We despise the literature of China, and are perhaps justified in doing so

* Tylor, *Early History of Man*, p. 106.

at present; but Chinese fiction is as good as a great deal of our own, and it is clear, at all events, not only that the written language answers its purpose, but that the use of it is easily acquired.

Modes of writing which seem bare and clumsy to us who are not educated to their use, or to the mental habits of those who use them, may convey ideas as fully and as rapidly as English print where they are native to the soil.

The transparency of thought is astonishing when it comes in a familiar medium. We continually see the end of a sentence at the very beginning, and catch a meaning where all the laws of language are set aside. A servant, having to explain to me the reason for the non-arrival of a joiner, once expressed it in these words: "The way he havn't came to-day, he was very busy making a coffin."

If English were a dead language, such a sentence would puzzle an archæologist, but we know at once what it means, though no picture-writing could be clumsier.

General acquaintance with the art of writing is not a necessary condition of every high civilisation, for this is reached when the needful culture is possessed, not by an entire nation, but by a number just sufficient to lead and direct the rest. To what extent it is possible to diffuse a similar culture through the whole body is a problem which our own age is trying to solve. We see already that the problem is highly complex, and that the nature of the whole result cannot be foretold. There are countries, like Egypt, where all the water is concentrated in a single river, and all the fertility depends on the wisdom with which it is distributed; and there are countries, like England, where rain falls everywhere, and each separate acre has its own supply. Both are fertile in a high degree, though in a different manner, and it is not easy to say which gives the better harvest.

So also with civilisation.

I believe the conclusions to be arrived at, from a knowledge of the written characters used by different races of men, require careful reconsideration, on the basis of a more liberal hypothesis concerning the culture of former days.

The history of our race will never be understood, unless we remember that civilisation itself cannot be exactly the same thing twice over. Men who are conscious of their power over nature in an equal degree, will yet exert it in ways dependent on the special objects of their desire. These will not be identical in the case of any two nations, and will differ very widely when the conditions of national and individual life are wholly dissimilar. A well known traveller and naturalist has told me his own conviction, that the English race would live and thrive in tropical islands, if they could really adapt their habits to the climate, and that in such a case they would have half the labour with twice the leisure of an average life in England. A nation of English blood under such conditions would have extraordinary opportunities, and would doubtless distinguish itself by great achievements; but we can hardly guess their nature, and we may be sure they would be very different from the achievements of the British Isles. There can be no doubt, I think, that the circumstances would not be favourable to the growth of literature, or to the study of many sciences, simply because there would be no fire-sides, and little indoors life, and the necessities of life would be fewer in every way. The nation would devote its spare time and energy to objects determined by natural choice to a much greater extent than is possible here, and would be more likely to become great in some single thing, than to show the many sided abilities of our present civilisation, forced upon us now by the number and the pressing nature of our actual wants.

This is a matter deserving the greatest attention. I

believe we often entirely misread the past by supposing that the outward signs of civilisation must always be the same, and must be such as are found among ourselves. From this arises that anomaly in our view of history by which we think of all ancient nations as semi-barbarous, because their knowledge and culture were not of the kind in which we take most interest, disregarding the proofs and products of intellectual power, and of its application to the uses of its own age. We still apply the word barbarian as the Greeks originally applied it, to people whom we do not understand. But nations who leave behind them the thoughts of Confucius or of Zoroaster, the language of the Vedas, the buildings of Egypt, or the sculptures of Nineveh, have been our equals in all human qualities and powers; and to think of them as our inferiors, because under different circumstances they used their time and their talents in different ways, is to set the work above the workman, and to make civilisation an inventory of goods and chattels, and not a standard measure of the human mind.

It is surprising to see on what thin threads of knowledge we hang our settled notions of ancient times. The name of Babylon, for example, is associated with the idea of social vice as characteristic of an entire people. But the statements of Herodotus are incredible in this sense, and the Hebrews knew the Babylonians only as enemies. What is true is doubtless that an immense prosperity led, as it always tends to do, to extreme social corruption, at a certain time and among conspicuous classes. The decay of the empire was the natural consequence; but its rise and greatness would have been impossible if sterner morals had not prevailed before.

Or again, in the case of Egypt; it has been assumed that the early Egyptians must have been comparatively ignorant

of astronomy and mathematics, because this was true of their successors in historical times ; and this idea is so fixed upon us, that the building of the Great Pyramid has very lately been attributed to supernatural direction, by Professor Piazzi Smyth, simply because discoveries made concerning it seem to him to imply a very remarkable acquaintance with these branches of science.

There is, however, nothing supernatural about the alleged facts, that the vertical height of the pyramid is to twice its base, as the diameter is to the circumference of a circle ; that the same length of twice base divided by the number of days in the year gives a measure which is the ten-millionth part of the earth's axis of rotation ; that the fiftieth part of this measure is the English inch ; that the English quarter of wheat is the fourth part of the cubical capacity of the porphyry coffer in the centre of the pyramid ; that the word pyramid probably means "measure of wheat ;" that the orientation of the building is rigidly true, far beyond that of any other ancient structure ; that the descending passages in it point to the culminating places of the pole star of four or five thousand years ago ; that all these proportions are exact to an extraordinary degree ; that the pyramid is thus a standard of measurement of every kind, and that unalterable precision is finally gained by making the mass of the great structure just sufficient to produce a constant temperature in those central chambers where measures would be adjusted.

Such statements are very remarkable. They are disputed by most Egyptologists, and are still matter of strong debate. But supposing all of them to be true, the sound inference would only be that the builders of the pyramid knew perhaps as much as we do on these particular subjects, and that their interest in questions of measurement was strong enough to induce them to erect such a building. We

take quite as much pains ourselves, for just the same purposes, only we make metallic instruments in stone observatories, and express our results by building up piles of figures in book cases, instead of pyramids in the open air. What is surely to be noticed most, is the curious blindness by which we have failed to see that men who could build the Great Pyramid at all were intellectually able to do anything within human reach, and that what they would actually accomplish would be a question of circumstance, and not of power. Such a building, in its mass and in its structure, in design and workmanship, is one of those things that can never be either conceived or executed, without the knowledge, taste, skill, foresight, patience, energy, and command over nature which are the very elements of the highest civilisation; and to see results of this kind without discerning the nature of their cause, is like picking up figs in the wilderness, and yet believing that, being in the wilderness, they must have grown on thistles.

The great pyramid is one of the oldest Egyptian monuments, and the evidence it gives of a vigorous and cultured nation is entirely borne out by all that followed. We know that the power of Egypt lasted for an almost unexampled length of time with a splendour which showed itself from age to age in a succession of surprising works, and in all forms of social refinement as well as political greatness. This is only possible to the highest races of men; who must be among the highest before any such career can be begun. If, therefore, we find reasonable proof that they possessed knowledge hitherto supposed to be exclusively our own, there is no ground for surprise or incredulity. Where the seed is, the harvest may spring up at any favourable time.

Nor does subsequent ignorance prove that knowledge has not been possessed before. Of this, the discoveries concern-

ing ancient art continually bring fresh evidence. The glass from Assyria and the bronzes cast upon cores of iron are striking examples. The latter is especially important. It shows that the use of iron was well understood by the Assyrians, and that the use of bronze in ancient times was the result of choice, and not of ignorance. We might, I think, have safely assumed this on general grounds, and might thus have avoided much misleading speculation concerning a bronze age. Archæologists take for granted far too readily that if any thing valued by ourselves was not used in former times, it cannot have been known, without considering what reasons besides mere want of knowledge may have led to its neglect. In the use of metals especially, customs, climate, and material interests will chiefly determine the purposes of their application, the whole being further modified in all ages by questions of transit, and especially of fuel. In hot countries generally the temperature at which iron must be worked, except in a small way, is a discouragement to its manufacture. A numerous and energetic people in the valley of the Nile would find themselves with a great deal of spare time, and the colossal nature of their works is probably due to this surplus power, and not to a cruel tyranny, the exercise of which would be inconsistent with the long continued greatness of the nation; but in a country like Egypt, where fuel must always have been very scarce, while stone was abundant, there was every reason to make the greatest use of stone and the least of metal.

The question of fuel as affecting the history and habits of nations has never been properly considered. We pick up a sunburnt brick, and treat it as a proof of ignorance in the makers. It may, on the contrary, be the evidence of a most wise economy, which utilised the sun's heat where it was sufficient for the purpose, and where artificial heat could only

be applied at too great a cost. The makers of sun-burnt bricks in Assyria and Egypt certainly understood the use of fire as well as we do, and it may be well for us if we can turn the solar rays to equally good account.

Concerning iron, it is important to remember that although some of its ores which are widely distributed are easily reduced in a charcoal fire, this can only be done on a small scale, and the product is soft iron. But the great value of iron depends on its production in large quantities, and in its carbonised forms as cast iron and steel; and this requires a much higher temperature and a great expenditure of fuel. The discovery of cast iron, moreover, must have been accidental wherever it has occurred, and it is not therefore a test of intellectual position among nations. And finally, our knowledge of the extent to which iron has been used in the past, and of the circumstances under which the art of working it may have been lost in various localities, is so limited by the perishable nature of the metal that it is never safe to form positive opinions about it from merely negative evidence. This has been forcibly illustrated by the discoveries of ancient iron work in Assyria, and again by the great iron column found in Delhi, apparently the work of the fourth century, a cast of which has just been placed in the South Kensington Museum. This column is a solid shaft of wrought iron, more than fifty feet long, and about eighteen inches in diameter. No other piece of iron work at all like it has been found in the east; and two things are made clear by its discovery. It shows that the manufacture of iron in large masses was practised in India at least two thousand years ago; for the art could not be in its infancy when this column was made; and it also shows that the old iron work has disappeared, leaving no tradition of its former state. Nothing of any considerable size in iron has been made in India in recent times.

The absence of iron among the Mexicans at the time of the Spanish conquest has been supposed to illustrate a particular stage in human progress. But the Mexicans were far above many tribes who make iron implements, and the fact was that they had a substitute for metal as a cutting material, which doubtless had an influence on their metallurgy. They had an abundance of obsidian, in the form of a volcanic glass, so hard and sharp that the fresh flakes were used as razors, and so easily worked that the cost was as small as possible. A people who possessed this material, and who had such skill in using it that they were able to execute the splendid sculptures of their now ruined cities, might well ask themselves, in an uncommercial age, why they should manufacture iron under a tropical sun; and a nation which can execute great works with imperfect tools is to be classed higher, and not lower, from this circumstance. Our own phase of civilisation leads to an extreme perfection in the instruments with which we work, but the result of this upon the national character and intellect is far from clear. We make it continually easier for an inferior workman to produce good workmanship through the mere excellence of his tools, and we thus displace the rougher and coarser products of former times; but the finer arts of the past are not exceeded among ourselves; in many cases they are by no means equalled; and there is abundant reason to fear that the workman's skill will grow less instead of greater as mechanism supplies our wants, and satisfies the average taste without the necessity for mental effort. To call such a state a higher civilisation would be a grave misappropriation of the term.

Nor are we even justified in assuming on negative evidence that we know all about the tools and inventions of former days. It is astonishing that the people of Central

America, from Mexico to Peru, should have accomplished what they did without better tools than we suppose them to have possessed. We probably know nothing of these nations in their best days. There are good grounds for thinking that they were even in the last stages of decay at the time of their discovery by Europeans. Their best works were their oldest, and the rapidity with which they fell, not only into disorder, but into little better than savage life, is, I think, sufficient proof of their real decrepitude. Races who could make the ancient roads of Peru, and build the temples of Yucatan, could not drop so suddenly to so low a level unless their original energy had already vanished. "Here," says Mr. Stephens, by the ruins of Palenque, "here were the remains of a cultivated, polished, and peculiar people, who had passed through all the stages incident to the rise and fall of nations ; reached their golden age, and perished, entirely unknown." *

Those ruins were visited again three years ago by Captain Lindesay Brine, R.N. He confirms Mr. Stephens' account in all particulars, and expresses his own astonishment at the execution of such works, in hard limestone, with tools of obsidian and copper. In such cases we are left with two alternatives. Either better tools were used than we are aware of, or else the workman's skill overcame difficulties which would be formidable to ourselves. Which of these two would imply the higher condition of the race it is not very easy to decide. The notion that the mere patience of savages, whose time is of no value, may account for the production of works of this kind, cannot be entertained. Time is necessarily of value where large numbers of men work together, and only large numbers could accomplish what is found to have been done. The raised platform for the palace at Uxmal, for example, is five hundred feet square

* *Central America*, vol. ii., p. 356, 1842.

and fifty feet high : a structure containing some ten million cubic feet of solid work. According to Rawlinson's estimate, it would take a thousand men about six years to make a mere earth mound of this size.

In the manufacture of tools, some inventions of former days have certainly been lost. We do not know, for example, how ancient bronze was hardened and tempered ; and it is an error to suppose that the mechanical appliances by which the pyramids were built are fully understood. To raise immense blocks of stone in immense numbers, several hundred feet vertically, up a slope of more than fifty degrees, is a gigantic task, and its accomplishment cannot be satisfactorily explained by mere brute force, with the help only of inclined planes, rollers, and levers, or by the theory of annual additions and the step-like form of the unfinished building. Nor is it in the least probable that the inventors of such a building could not contrive better means for carrying out their design.

When Sir John Lubbock says of the American mound builders, that although they possessed copper they did not know how to use it, he falls I think into one of those mistakes by which we lose the right interpretation of ancient relics. All the copper tools and ornaments found in the mounds appear to have been made by hammering only, and not by casting ; and it is at once assumed that the race who used them had never discovered that copper could be melted and moulded. Some of the ornaments, nevertheless, are actually found to have been melted by the fires of the altars, and those who made them are supposed to have been too dull to notice what was thus happening before their eyes. There can be no sufficient grounds for such an inference. The people who observed and copied with such fidelity so many natural objects ; who made good pottery, and burnt their

clay till it was as hard as rock ; were not likely to be unobservant of the effect of fire on metals put in it by themselves. It is infinitely more just to suppose that they had reasons for hammering their copper instead of casting it, or that their castings, if they made any, have not been found. Whether by casting or hammering, they made at any rate such tools as were sufficient for works both of minute beauty and of enormous size.

When Dr. Wilson* speaks of "The art of the mound builders which found its highest object in the decoration of a tube or the sculpture of a pipe-bowl," he yields to this besetting sin of archæology. For we have no means of knowing whether these were the highest objects on which they employed their skill. A fortunate chance has taught us that these works at all events were made by their hands ; but what else of a like character they may have done is buried in the mystery of unknown centuries ago.

Sir John Lubbock's general view of the American evidence is altogether so characteristic of what I take to be the prevailing error caused by preconceived ideas upon these subjects, that I must ask you to consider it with some care. He describes the facts with his usual fairness, and admits the proof of three successive phases in the history of the North American races.

The first phase is that of the mound builders themselves ; the second, that of an agricultural people at a later period ; the third is that in which the country became overgrown with forest, and the inhabitants degenerated into savages. But having found these three phases demonstrated by existing evidence, Sir John immediately takes for granted a previous phase, of which there is no existing evidence. He says we see in America, first, that stage of original pro-

* Vol. i., p. 460.

gress in which the civilisation of the mound builders was developed from an original barbarism, and then the three succeeding stages, ending in a return to savage life.

Now there are no antiquities in America known to be older than the mounds, and there is therefore no evidence whatever of a previous barbarism. The sole ground on which it is inferred is the fact that the cereals of the old world were not known in North America, where maize was the only corn. The absence of those cereals, it is argued, proves that America was not first peopled from the old world after this became civilised; and that it must therefore have been peopled first by savages, whatever their origin.

I think you will agree with me in rejecting this argument as radically unsound. No one has discovered any time or place at which the civilisation of the old world first began. No one knows anything about the origin of its cereals. If America was really peopled from it some thousands of years ago, no one can say whether wheat and barley would have been carried there, or whether the soil and climate would have suited their culture at that time.

The positive facts as known to us at present are just these. In Europe, the oldest human monuments are those of barbarism which has been followed by civilisation, while in America the evidence is completely reversed, and the oldest monuments are those of civilisation which has been followed by barbarism.

In Asia and Africa, relics of both kinds are found, but their relative age is not generally discernible; while in Australia and the Pacific Islands savage life either appears on the present evidence to have been permanent, or, as in America, to have succeeded something higher.

I submit to you that this, considered as a whole, gives no

support to the opinion that all men were once savages, but that it is entirely consistent with the belief that civilisation and barbarism have co-existed in the world for an indefinite period. This belief necessarily includes the supposition that civilised races after a time decay, and that barbarous races rise occasionally to civilisation; and it fully accounts for the latter process, which the savage theory entirely fails to do. For nothing is more trite than the remark that no savage nation has ever been known to civilise itself; but, though it is habitually set aside, the argument involved in it has never been answered.

How is it that in the whole of Africa there is no example of native civilisation?—that the hill tribes of India continue to be savages, though they are supposed to be older inhabitants than the Hindoos?—that in Australia, where the natives have been left to themselves, perhaps for a longer time than in any other part of the world, the result is that they are at the very bottom of the scale of human nature? On the other hand, the wild Teutonic races of northern Europe have become the leaders of mankind. But how did they become so? Not in any single case by unassisted self-development, but always by contact and mixture with the elements of former civilisation. So it was with Rome; so with Greece. We cannot say, so also with Egypt, but that is because human knowledge extends no further back than four or five thousand years.

Observe, too, the special feature in America. Its civilisation once lost was never recovered till help came from without, in the shape of European intercourse and colonisation. To be isolated is plainly to lose the power of recovery, and we may well believe, from the example of Australia and equatorial Africa, that the longer the isolation the more profound will be the decay. It is the same thing through all nature. No organic being ever grows again from its own

dead body, though the products of its decomposition are often the very soil in which a living seed will flourish most vigorously.

I believe this view of the case gives us a clue to the explanation of savage customs which is quite wanting to the opposite theory.

The subject is a very wide one, and I shall only mention two illustrative cases.

The mode in which fire is obtained by savages has excited a great deal of attention. It is obtained almost universally by the friction of one piece of wood against another.

Now if a race of men, once acquainted with the arts of civilisation, became degraded into barbarism, and separated from the rest of the world, it is, I think, certain that they would generally resort to this method. Iron, matches, and tinder would cease to be procurable long before the fact that violent friction will set wood on fire would be forgotten. In such a case, they would naturally try their hands at producing violent friction. It is only practice that makes the process anything but one of extreme difficulty, but men who knew beforehand that it could be done would have the necessary patience, and would at last succeed in doing it. But in what way are we to suppose that a savage who knew nothing about it previously would be led to try the experiment? He could not learn by accident what the result would be. No one ever sets wood on fire by rubbing another piece of wood against it with his hands, unless he does it on purpose. Briefly, a resort to this method of procuring fire is the natural resort of men fallen from a higher state, but is not the natural discovery of men only just raised above the brutes.

In the second place, many pages have been written about the marriage customs of savages. Marriage by capture

particularly is regarded as belonging to a special stage of human progress, and anything in the forms of civilised life which seems to refer to it is taken as evidence of a lower state out of which the race has developed.

But though marriage by capture is a sign of barbarism, it is a barbarism at least as likely to be the result of degradation from something higher as of progress from something lower, for human passions would always lead men to take wives by force, wherever they were not restrained by moral considerations. Anything by which these restraints are removed leads to marriage by capture as a matter of course, and, as all civilised nations have been made by a mixture with barbarous ones, some traces of a custom for which there is so universal a cause are always likely to be found.

Closely connected with this are other practices, like the strange custom of the Couvade, when on the birth of a child the father takes to his bed, and lives for many days, or even weeks, on the most meagre diet, believing that this is for the benefit of his child. Those who do this cannot give a rational reason for it, and the theories concerning savage notions of paternity, by which it is sought to be explained, seems to me unreal and unnecessary. Far more probable is the supposition that this is the outward form in which some religious rite has been handed down long after its meaning has been forgotten. It is an act of self-denial for the benefit of the child. That at least is clear; and the origin of such an act is more likely to be found in previous civilisation than in the self-developed psychology of a savage.

Suppose the outward rite of infant baptism, for example, continued in some age which had entirely forgotten its original purport. It would seem as singular as the Couvade, and the traditional belief, that the child must suffer if it were omitted, would be as incapable of explanation.

The manner in which, not only the habits but the ordinary knowledge of civilised life, are actually lost, is shown under our own eyes in South America. The River Plate district was colonised by Spaniards, and is inhabited by a mixed race of whom the Spanish parents at least had the ordinary knowledge of Europeans. Yet Mr. Darwin found them entirely ignorant of the compass ; they asked him whether the earth or the sun moved ; whether it was hotter or colder in the north ; they took England, London, and North America to be names of the same place. He says he felt as if he was in Africa . The inhabitants of Central America are totally unable to rebuild the cities of their ancestors, and it is certain that the whole of this district would soon be entirely savage, if the influence of other races were withdrawn.

What else is the story of Asia Minor, once one of the chief seats of wealth and civilisation? It was formerly nearly as populous as modern France, and is covered with the ruins of cities so numerous, that the traveller is often impeded by their *débris*.

At present, this land is inhabited by only three million individuals ; a poor and degraded race, scattered over deserts and marshes.† And from Asia Minor to the mouth of the Euphrates, the eye passes over the scenes of former greatness which lasted for more than a thousand years. To look only at the sculptured heads of Assyrian warriors, is to see that these were kings among men. The products of their art and knowledge are perhaps the greatest treasures of our museums, though known to us only in wreck and ruin, after twenty centuries of burial. The very name Euphrates means exhilaration, and the people who once dwelt by its waters were among the splendid races of mankind. Who are their successors? The wild tribes of Lebanon ; the robbers of

* *Narrative*, vol. iii., p. 48.

Tchihatchef, *L'Orient*, 1868, p. 802.

Moab ; the scanty and mongrel population of what once was Mesopotamia. All the present inhabitants of this district might have lived within the walls of Babylon ; they are utterly unable to improve their own condition ; and, as in Central America, they are doubtless only kept from falling into complete barbarism by the near neighbourhood of the civilised world.

The view of human history which I have endeavoured to illustrate, and which I wish to offer to your consideration, may be summed up as follows :—

Savage life is the result of decay and degradation ; not the decay of any one race originally perfect, but of every nation which has failed in moral and intellectual power, and has become isolated in its failure.

When such degenerate races do not become isolated, they disappear by absorption and extinction ; but when by political, geographical, or other causes they are left to themselves, they begin a new phase of human discipline. Losing the arts and knowledge of civilised life, they are thrown upon natural resources, and into a new struggle with nature. The result varies widely. In some cases the race sinks to a level from which recovery is impossible. These are the savages who, when civilisation again approaches them, die out before it, incapable of its reception. In other cases, a ruder life gives back the vigour that had been lost, and a race is formed, wild, ignorant, barbarous in thought and habit, but with the strength and energy which, when opportunity arises, become fired with ambition, and start upon a new career. These are the barbarous hordes which from time to time come out from their obscurity, and refresh an enervated world. Such as these were our Teutonic ancestors ; such also were doubtless the founders of the Aryan race. Similar tribes are probably always forming in some parts of the world. Natur-

ally they cannot be discerned till the time comes for them to disclose themselves, and this time can only be in periods when, as at the close of the Roman Empire, the chief civilising powers of a continent are worn out and ready to fall.

The views I have submitted to you would not be tenable if after all they were inconsistent with those important facts which the study of pre-historic archæology has brought to light, concerning the widespread existence of savage life in former times, and the successive stages of progress in many parts of the world. But I think the two lines of investigation, instead of contradicting, mutually confirm each other. If the lower races are formed by decay of the higher ones, and the higher races by renovation through the lower ones, the whole process forms a cycle of change which may be indefinitely repeated. There is, then, no further difficulty as to the antiquity of man, for we can carry this back as far as necessary without being compelled to believe that the earth has been peopled through vast periods of time by the most brutish forms of humanity alone, or that these, from whom no higher races ever rise at present, were the progenitors of the noblest of mankind. The general resemblance among the arts of savages is at once accounted for, if these are a residue from the forgotten arts of civilised life. So is the peopling of the world in all habitable parts, and the wide diffusion of similar races and languages. So is the upward progress in Europe, where northern barbarism mingled by degrees with the failing culture of the south and east; and the downward fall of America, where no similar elements of strength had been prepared to renovate the era of decay. So also are the facts that the stone tools of savages, since they do not decay, are found in all quarters of the globe, and that the relics of ancient civilisations, of which the origin is unknown, are scattered perhaps as widely.

These views are, I know, at variance with the current ideas concerning the nature of human progress, and of the future prospects of this world. But those ideas are vague and insubstantial visions, in which the highest interests of mankind have, I think, been quite overlooked. The possibility of progress is the birthright of every individual ; but it has been secured once for all by the very conditions of human life. For every man, whether his natural gifts are many or few, is born in absolute ignorance and helplessness ; and progress, to the highest condition of which his nature is capable, is always possible to him unless his life is extinguished.

But the hope of progress, to have any powerful influence upon us, must be the hope of something in which we ourselves, or those who are really dear to us, can share ; not the hope that a higher race of beings will inhabit the earth long after we have done with it. If I heard that the Emperor of China was a much better and nobler being than myself, I do not feel that I should be much elated by the news. Even if I congratulated himself and his subjects, my personal feelings would be rather grim. In like manner, the knowledge that my own lot, and the lot of those I love, was a very miserable one compared with what my descendants would inherit a thousand years hence, could not give me a very cheerful view of life in general. Nor is there any selfishness in this, for selfishness does not consist in highly valuing our own happiness—this is surely what the angels do—but in being willing to sacrifice the happiness of others in order to secure our own.

The hope of improving the condition of others in whom our affections are interested is indeed one of the highest motives for exertion ; but to suppose that we can carry such affection forward to far distant generations is to misinterpret human nature. The feeling which is mistaken for such

transcendent love is a sentimental product of the imagination, which seeks to render the hope of individual immortality unnecessary to our happiness, by persuading us to forget the individual and to think only of the race. The feeling is false to nature, and can never be a real power in the world.

And though a notion of a golden age in the future might be all very well for our descendants, how about our ancestors? What was the cruel fate that obliged them to be born too soon? We mistake the nature of the golden age, which is always within us, and not without us, which is sometimes a time of progress, sometimes of repose, sometimes even of decay; for old age can be as bright as infancy, the whole question being as to the inward product, and not as to the outward means. But, in every nation, while progress is desired it is always possible, and in this case it is always necessary to healthful life. The desire for it may cease, from real contentment with conditions already attained, or from intellectual weakness, or from moral defect, and progress will always cease with the desire. That desire perhaps was never stronger than it is now among ourselves; our duty is to follow its direction, and reap its fruits; and there is no reason to doubt that the opportunity for doing so will last for many generations. What will follow in the future is always hidden; but whatever interest there may be in the contemplation of savages, developing after countless ages into something higher, and ultimately giving rise to races far superior to ourselves, there is, I think, a nobler satisfaction in looking upon this world as a sacred garden, in which the nations of men are as it were the trees and flowers, each in its turn growing up according to its kind. Each also coming to its natural climax, and then falling to decay, but only to give place and to give birth to others, like it though not the same, by which a varied but equal beauty is maintained, and a constant purpose carried out, through ages of ages.

ON THE PSYCHOLOGY OF BELIEF.

(THE ROSCOE LECTURE FOR 1873,)

By WILLIAM B. CARPENTER, M.D., LL.D., F.R.S.,

CORRESPONDING MEMBER OF THE INSTITUTE OF FRANCE.

THE progress of Thought has been likened, by an able writer of our time, to a succession of waves which sweep over the minds of men at distant intervals : —

“There are periods of comparative calm and stagnation, and then times of gradual swelling and upheaving of the deep, till some great billow slowly rears its crest above the surface, higher and still higher, to the last ; when, with a mighty convulsion, amid foam and spray, and ‘noise of many waters,’ it topples over and bursts in thunder up the beach, bearing the flood-line higher than before.”

“In the eyes of those who have watched intelligently the signs of the times,” continued Miss Cobbe,

“It seems that some such wave as this is even now gathering beneath us, a deeper and broader wave than has ever yet arisen. No partial and temporary rippling of the surface is it now ; but a whole mass of living thought seems steadily and slowly upheaved, and the ocean is moved to its depths.” *

The experience of the last ten years has so fully justified this grave warning, that it clearly becomes all who duly care for their own and their children’s welfare, to look well to the foundations of their Beliefs, which are likely soon to be tested by such a wave as has never before tried their solidity. New methods of research, new bodies of facts, new

* Preface to the Collected Works of Theodore Parker, 1868.

modes of interpretation, new orders of ideas, are concurring to drive onwards a flood which will bear with unprecedented force against our whole fabric of doctrine ; and no edifice is safe against its undermining power, that is not firmly bedded on the solid rock of Truth.

How, then, are we to prepare ourselves to meet it ? Shall we, like Canute and his courtiers, rest secure in our own supremacy, and try to keep back the waves by simply forbidding their advance ? We need not go as far as Rome for examples of this mode of dealing with the difficulty ; for we have a good many minor popes at home, who can scold quite as well — and just as ineffectually. Shall we go out, as Mrs. Partington did, with pattens and broom, to try and sweep away the Atlantic ? Such seems to me the method of those who think to put down a great Scientific hypothesis by citing a text or two ;* setting themselves up on the pattens of Authority, and using arguments that are no more capable of holding water than the incoherent twigs of a besom. Or shall we imitate the able Engineer, who, without experience of the power of a Channel-sea driven onwards at highest spring-tide by a S.W. gale, thought to protect his railway-embankment by a massive wall ? That wall was broken down, that embankment washed away, by the very first storm that tested its security. And so will it be with any barrier which the Intellect of Man may try to erect against the progress of other Intellects than his own ; for it is only the Source of all Thought who can say, “Hitherto shalt thou come, and no further, and here shall thy proud waves be stayed.”

To what example, then, can we look ? What better can we desire, than is supplied by that wonderful Edifice, which, for more than a century, braving the violence of the most destructive storms, has calmly and unintermittingly

* See *Priests and Philosophers*, by the Rev. W. Greswell.

displayed its guiding light to the wave-tossed mariner, and has furnished the pattern of every similar beacon elsewhere erected for the direction and warning of the navigator. I need not tell you to what I refer; for Smeaton and the Eddystone are household words to every Briton. But I would show you something of the mind of the man who executed what has been characterised † as “the most arduous undertaking that had fallen to any engineer, and than which none was ever more successfully executed;” and something, too, of the way in which he prepared himself for his great work.

The mind of Smeaton is made known to us in that admirable series of Reports on Engineering subjects which were described by the same competent authority as “a mine of wealth for the sound principles which they unfold, and the able practice they exemplify; both alike based on close observation of the operations of Nature, and affording many fine examples of cautious sagacity in applying the instructions she gives to the means within the reach of Art.” It was to Nature, not to the time-honoured traditions of his profession, that this great practical Philosopher went, when he had to deal with the problem of the Eddystone. He saw in the bole of the oak which had stood the blasts of centuries, the shape that would not only give to his tower the greatest inherent strength, but would project upwards, instead of directly resisting, the dash of the impetuous waves. And he then brought all the resources of constructive skill to carry out this sagacious design; erecting on a broad and solid foundation that beautifully-formed superstructure, which not only bears aloft the far-shining and welcome light, but serves as the dwelling place for those who are charged with its maintenance.

† Introduction to the first volume of the *Transactions of the Institution of Civil Engineering*.

And this, it seems to me, is the way in which we should endeavour to erect our own Fabric of Thought, if we wish it to be enduring in itself, — withstanding alike the rude assaults of external force, and the gradual weakening of internal decay, — and to afford a guiding light to others. Our foundations must be laid, broad and deep, in the Intellectual, Moral, and Physical Constitution of Man, and his relation to all that is outside him. Those fixed and immutable principles of Reason on which all knowledge is based, must be solidly and patiently built up, course by course; each securely bolted down to that which supports it. We must learn early “to distinguish what is just in itself, from what is merely accredited by illustrious names.” We must cultivate the insight which shall enable us to detect a fallacy of observation, or a weakness of deduction; and determinately reject from our ground-tiers every stone that is not fit to bear the weight of the superstructure we intend to raise upon them. Recognising it as a fact in the History of Human Thought, that every great Error contains some admixture of Truth, from which its power over men’s minds is essentially derived, we must so shape our fabric that it shall direct, rather than oppose, the force of the aggressive wave. And then, though our skill may not suffice to give permanence to our weaker superstructure, though our lantern be shattered and our light for a time extinguished, we shall retain a secure basis on which to rebuild our tower, crowning it with a new and more enduring dome, and setting in it a lamp of yet brighter lustre.

Such, I persuade myself, would have been the mode in which we should have been counselled by the calm wisdom and richly-stored historic experience of that illustrious Man, whose memory you are now met to honour; had he lived in these times, and been brought face to face with the problems

we have now to meet. Accustomed as I have been from boyhood to hear his name mentioned with affectionate respect, counting some of his descendants among my most valued friends, and not unfamiliar with the general bearing of his historic writings, I cannot be ignorant of the life-long consistency with which he advocated the cause of human freedom and human progress; of the grave severity with which he reflected on the intolerance of those Reformers, who, while struggling against the absolutism of papal Rome, endeavoured to make themselves scarcely less absolute; and of the true philosophy and lenient charity with which he attributed that intolerance to the habit ingrained in their nature by their early training, of which it was scarcely in their power to divest themselves.

And in now inviting your attention to that most important question of practical Psychology,—the mode in which our Beliefs are formed, and the degree in which we are personally responsible for them, — I am but following a path which he marked out, towards a conclusion in which I persuade myself that he would have concurred.

Our Beliefs must be carefully distinguished from our Knowledge; and they seem to me to bear much the same relation to it, that our furniture has to the building in which we put it. The walls are (or ought to be) solid and enduring; so is everything that deserves to be called Knowledge. Each stone supports, and is supported by, the rest; and nothing but a weakness of its foundation or a decay of its material can make our Fabric of Thought uninhabitable. But the Beliefs with which we furnish it have not the same durability. Adapted to meet our temporary needs, they may be either poor in material, or but slightly put together. A carpet wears out, and, when past shifting and patching, must be replaced by a new one; a table or a chair breaks down,

and, after successive repairs, is discarded as no longer serviceable. Or perhaps our own requirements change; and some article which was at first made expressly in accordance with them, proves no longer suitable to our needs; so that, finding it in our way, we wish to get rid of it. Some pieces of our furniture, again, originally of more substantial make, have become faded and old-fashioned; but they may be family heirlooms, or we may have ourselves become attached to them; and so, not liking to discard them altogether, we put them away in some dark corner, or perhaps consign them to a seldom-visited lumber-room, where they rest almost forgotten in their obscurity. But at last some ray of sunshine throws a brighter light than usual upon our dark corner; or the opening of the shutters of our lumber-room lets into it the unwonted light of day; and we then find our old sofas and four-post beds so moth-eaten and decayed, that we turn them out of our house instantaneously.

I shall not pursue this comparison at present, but propose to resume and develop it hereafter.

Although Belief, as Dr. Reid truly says, "admits of all degrees, from the slightest suspicion to the fullest assurance," yet we commonly use the term to designate that form of Assent to any particular proposition, which, while falling short of positive certainty, is yet sufficiently complete not only to serve as the basis of our further reasoning, but to direct our course of action. And it is chiefly in this sense that I shall use the term on the present occasion; distinguishing Belief, on the one hand, from that complete assurance which constitutes positive Knowledge, and, on the other, from that merely speculative or provisional acceptance of a proposition, which neither shapes our thought, nor governs our action, and which really constitutes little more than an absence of *disbelief* in it.

You are all familiar with that current doctrine in regard to the nature of Belief, which assumes that we "try" every proposition in our Court of Intellect, just as we try a prisoner in a Court of Law. We are supposed to listen with equal attention to the evidence adduced on each side, and to give our best consideration to the arguments which the opposing advocates rest upon it. Holding our Intellectual balance with eyes blinded like those of Justice, we poise against each other the two aggregates of *pro* and *con*; and according as one or the other side is made to go down by the "preponderance of evidence," do we accept or reject the proposition.

It is clear that with this act of Judgment, if performed with perfect impartiality, the Will has no concern whatever. We can no more help the determination of our Belief by a decided preponderance of evidence, than we can prevent the scale of a freely-suspended balance from being depressed when a preponderating weight is put into it. We may, it is true, by placing our hand on the opposite arm, determinately depress the lighter scale; and so, by bringing the Will to bear upon our judgment, we may force ourselves to *accept* a conclusion to which we do not really *assent*. But this is no more a true Belief, than the deliverance of a Jury under coercion, against the weight of evidence, is a true verdict. And yet universal Experience testifies to the truth of the proverb, which is, in fact, an embodiment of it, that "we easily believe what we wish." How, then, is this influence exerted?

In those old Political Trials, which are now happily—so far as our own country is concerned—only matters of history, it not unfrequently happened that the Prisoner's life or death, whilst determined by the verdict of a Jury honestly meaning to be impartial, really depended on the partisan conduct of the presiding Judge. For though the Jury were

all sworn, and really intended, to give a "true verdict according to evidence," yet the Judge had it largely in his power to determine which way the balance should incline. In the first place, he might refuse even to consider the objections which the prisoner's counsel was fully justified in taking to the indictment, and might accept the reply of the Crown-lawyer as all sufficient, when it did not really meet one of the points raised for the defence. Again, while treating the witnesses for the Crown with the utmost consideration, assuming the truth of every statement they may make, and placing every obstacle in the way of the sifting of their testimony by cross-examination, he treated the witnesses for the defence as if they were utterly unworthy of credit, and allowed the Crown-counsel the utmost licence in his endeavour to lower the value of their testimony by unjustifiable insinuations or bullying assumptions. And in his "summing-up," he would so forcibly present to the jury both the law and the evidence on one side, and so determinately keep down the force of law and evidence on the other, that the jury might be honestly compelled, even against their own prepossessions, to give a most iniquitous verdict.

And so in the discussion of a question of Intellectual Truth, the Will has the power of keeping some considerations more or less completely out of view, while it increases the force of others by fixing the Attention upon them. Another familiar proverb, that "there are none so blind as those that *won't* see," precisely expresses the way in which the Will thus exerts its influence. For as the opponents of the Copernican system refused to look at the Satellites of Jupiter through the telescope of Galileo, so there are too many who wilfully turn away the eyes of their minds from inconvenient truths; or refuse to let a gleam of sunshine into the dark chambers of their intellects, where they hide as sacred treasures the antiquated beliefs of past ages,

the worthlessness of which would be at once apparent if the full light of day were permitted to shine in upon them.

On the other hand, the Will, when inspired by the habitual desire to act on the highest principles of *right*, determinately blinds us, not only to the direct promptings of self-interest, but to those arguments which we instinctively *feel* to be sophistical, though we may not be able logically to expose their fallacy; just as Nelson at Copenhagen turned his blind eye to the signal for his recall, which he did not think it for the honour of his country to obey.

But how comes it that, even when the most rigorous impartiality is maintained, the judgments thus *automatically* delivered by different Intellects on the very same evidence are so notoriously diverse? The great Tichborne case, for example, cannot be brought up in any society, without eliciting opposite verdicts from self-constituted jurymen, who profess to have followed the course of the whole trial with the greatest care, and whose decisions cannot be supposed to have been swayed by the least admixture of partiality or self-interest. The clue to this diversity is found in the further fact, that even those who agree in their conclusion will often be found to have formed it on dissimilar grounds; the respective weights of the several evidentiary facts being very differently estimated by different individuals. And thus we are led to this result; that the weights or probative values of such evidentiary facts are *not absolute quantities*, but *matters of personal estimate*; being — like our sensations of heat or cold, as compared with the indications of the thermometer — the expressions of their effects upon our own consciousness. For while there are some things as to which the common consciousness of Mankind is in perfect accord, there are others which impress different individuals so diversely, that we are forced to regard what may be termed

the *personal equation** of each recipient, as a factor whose importance is at least equal to that of the impressing force, in the determination of the resultant Belief.

The nature of this "personal equation," and the degree in which its determination lies within our own power, constitute, therefore, the essential part of our enquiry.

No one can attend to his own habitual course of Thought without recognising it as a fact, that the judgments which determine his Beliefs in regard to a very large proportion of the propositions that are constantly coming before him (as, for example, in the reading of his daily Newspaper), are so direct and immediate, so little governed by any processes of conscious ratiocination, as to have much of the *intuitive* character. We estimate the worth of each statement, partly by our appreciation of the external evidence on which it rests, but still more (in most cases at least) by what we call the internal evidence of its *intrinsic probability*. But this intrinsic probability, like the respective weights of the several facts which make up the aggregate of the external evidence, may be estimated very differently by different individuals; the "personal equation" of each being often its most important factor. For while there are some propositions which are at once decided with absolute unanimity by an appeal to the "common sense" of Mankind, there are others on which very different decisions are given, with no less directness and assurance, by different individuals, according to the respective mental state of each at the moment; the response of every individual Mind to any such question asked of it, being as much the result of the antecedent condition of that Mind, as our feeling of heat or cold, when we plunge

* This term is used by Astronomers to mark the quickness of Sight by which each of several observers is characterised; any visual phenomenon that is being watched for by two observers at once (as, for example, the contact of a star with the wire of the transit-instrument) being usually seen appreciably sooner by one of them than by the other.

our hands into a basin of lukewarm water, is dependent upon their previous thermal condition.*

Let us take as an example of an immediate judgment in which there would be a general if not an universal accordance, that which any person of average intelligence would give upon the case put by Paley in the opening sentence of his *Natural Theology*:—"In crossing a heath, suppose I pitched my foot against a stone, and were asked how the stone came to be there; I might possibly answer that, for anything I knew to the contrary, it had lain there for ever; nor would it perhaps be very easy to show the absurdity of this answer." Now what is it that determines our immediate rejection of a proposition, which, as Paley truly intimates, cannot be easily refuted by any strict logical process? Perhaps neither the child nor the savage would have anything to say against it; yet no member of an educated community could entertain it for a moment. For what we call our ordinary Common Sense pronounces its adverse decision in the most distinct and explicit form, immediately that the proposition is brought before its tribunal; its judgment being an *acquired intuition*, which may be regarded as the *resultant* of the impression made by a great aggregate of experiences, upon the general Intelligence, or *Nous*, of the individual.

But in a large proportion of cases, the matter is one which lies outside the range of ordinary "common sense;" some special preparedness being required for the right appreciation of the inherent probability of the statement. One among my audience, for example, who has no previous information on the subject, happens to read the entertaining and (in certain aspects) very suggestive *Autobiography* of Robert

* Thus if we immerse the right hand for a short time in cold water, and the left in hot, and then transfer them both to water of medium temperature, this will be felt as warm by the right, and as cold by the left.

Houdin the Conjuror, and meets near its conclusion with the following passage :—

“The furnace (of an iron-foundry) was opened, and a jet of molten metal, about the thickness of my arm, burst forth. Sparks flew in every direction, as if it were a firework performance. After the lapse of a few minutes, my companion walked up to the furnace, and calmly began washing his hands in the metal, as if it had been lukewarm water. I walked forward in my turn; I imitated my companion's movements; I literally dabbled in the burning liquid; I took a handful of the metal and threw it in the air, and it fell back in a fire-shower on the ground. The impression I felt in touching this molten iron can only be compared to what I should have experienced in handling liquid velvet, if I may so express myself.”

Any ordinary reader would be fully justified in treating this wonderful narration as Houdin's account of some new kind of conjuring trick, like the “inexhaustible bottle,” the “aerial suspension,” or the “second sight,” mentioned in his previous pages. For he would scarcely be more able to conceive of a man literally and actually immersing his hands in molten iron, without any special preparation, and withdrawing them unharmed, than he could suppose an unlimited quantity of several different liquids to be poured out of a single bottle.

Another reader, however, finds no inherent improbability in the narration; for he knows that a special study had been made by M. Boutigny of that “spheroidal state” of bodies, of which we have a familiar example in the rolling and jumping of drops of water upon a red-hot iron plate; and that between this phenomenon (which is in itself sufficiently wonderful, when we come to think of it), and the harmless immersion of the hand in molten iron, M. Boutigny had worked out a continuous series of experimental marvels, all of them referable to the same simple and intelligible principle, — *viz.*, the interposition of a film of vapour between

the heated plate and the water thrown upon it, or between the molten iron and the hand immersed in it,* which prevents absolute contact between the two. Our second reader might himself, perhaps, have been present at the Meeting of the British Association in 1845, at which M. Boutigny gave an account of these investigations, and publicly exhibited the freezing of *water* in a red-hot platinum crucible (an experiment which Faraday afterwards capped by freezing *mercury* in a like vessel); and at which, also, one of the workmen at Messrs. Ransome and May's foundry, in the presence of a large number of competent witnesses, did exactly what Houdin describes. Or, if he was not himself present, he knows that M. Boutigny's experiments were fully accepted as genuine at the time by the whole Scientific world; that they have never in any way been called in question; and that the doctrine founded upon them is now universally recognised as an established principle in Physics. Thus he has been prepared by his previous training for the ready acceptance of Houdin's narration; he feels assured that the occurrence *might have* happened exactly as it is described, this very M. Boutigny being named by Houdin as his companion and exemplar; and looking to the reason assigned by Houdin for enquiring into the subject,—*viz.*, his desire to account for the wonders he had himself witnessed in the performances of the Arab conjurors, whom he was sent by the French Government to outdo (these men walking with bare feet upon red-hot bars of iron, and licking red-hot plates with their tongues),—he sees no reason for discrediting Houdin's statement that it really *did* happen.

To the well-informed Physicist, the *internal* evidence of conformity to a general principle is here so satisfactory, that

* If the hand be naturally moist, there is no need of any preparation whatever; if it be dry, the hand should be previously dipped in water and wiped on a towel.

he needs but a very small weight of *external* testimony to justify his belief in the particular fact narrated. But to anyone who comes freshly to the subject, the affirmation seems to rest on external testimony alone; while the negation afforded by the inherent improbability of the statement is to his mind so decisive, that he deems himself fully justified in repudiating it altogether. Supposing, however, that a scientific friend points out to him, that he has no title to set up a judgment which has no other basis than his own ordinary common sense, against that of men who have given special attention to this department of inquiry, and who agree in asserting, not only that the fact is true, but that it admits of a satisfactory explanation; he then, if not over-confident in his own judgment, withdraws the negation, and accepts the affirmative, in deference to the authority by which it is supported; still, however, without feeling that assurance which constitutes "conviction." But, further, if he can then be induced to go, step by step, through the whole series of experimental researches which lead up to this wonderful climax, he comes to feel the full force of that internal evidence, which not only removes all difficulty in the acceptance of the asserted fact, but shows that it has an inherent probability of its own, as a particular case of a well-established general principle. And yet I suspect that, however strong his mental conviction as to the safety of the act, there is not one of us who would venture to hold his hand in a stream of molten iron, until he had previously seen another person do so with impunity.

Another illustration, in a very different line of inquiry, may be drawn from the recent case of Louise Lateau,* a Belgian peasant girl, who has exhibited the curious phenomenon of "stigmatisation,"—that is, a spontaneous periodical bleeding, without any actual wounds, from the hands and

* *Macmillan's Magazine*, April, 1871.

feet, the forehead and the side, which were pierced in the crucified Saviour. By Catholics, this occurrence (like previous cases of the same kind) has been trumpeted as miraculous; while by Protestants, it has been denounced as an imposture. Here we at once see how completely the antecedent condition of each mind has determined the response; the external testimony as to the facts of the case which satisfies the former, being altogether repudiated by the latter, on account of what they regard as its inherent improbability. But to the Physiologist who has carefully studied the local effects which concentrated Attention can exert on bodily organs, especially when coupled with a strong expectation of a certain result (such expectation being peculiarly efficacious when associated with strong Religious Emotion), the case presents no difficulty whatever. The testimony of the numerous and competent Medical witnesses, fully on their guard against sources of fallacy, and determined to detect the cheat, if cheat there were, affords as strong a body of external evidence as could be brought to prove the reality of any occurrence whatever. And so far from finding any inherent improbability in their narrative, I can only say for myself, that its internal evidence is to my mind quite as strong as its external. The subject of it was obviously one of that class of young women who are known to every Medical practitioner as peculiarly liable to "possession" by "dominant ideas;" and this possession manifested itself in a periodical "ecstasy," a form of natural Somnambulism, in which the mind, entirely closed to the external world, is entirely given up to its own contemplations. Her current of thought and feeling in this state uniformly ran in the direction of the Saviour's Passion, the whole scene of which seemed to pass before her mind, as might be judged from her expressive actions; and a strong evidence of the reality of the condition was afforded by the fact, that, according

to the testimony of the Medical witnesses, each fit terminated in a state of extreme physical prostration, which could not have been simulated, the pulse being scarcely perceptible, the breathing slow and feeble, and the whole surface bedewed with a cold perspiration. Now the transudation of blood from the skin through the orifices of the perspiratory ducts, under strong emotional excitement, being a well-authenticated Physiological fact, there seems to me nothing in the least degree improbable in the narrative; on the contrary, anyone who accepts the "charming away" of warts, and the cure of more serious maladies, as results of a strongly excited "expectant attention," will regard the stigmatisation of an Ecstatica as the natural result of the intense concentration of her thoughts and feelings on a subject that obviously had a peculiar attraction for them.

Thus the Belief of the Catholic partisan in the "miraculous" theory, that of his Protestant opponent in the "cheat" theory, and that of the scientific Physiologist in the "natural" theory, all of which have the same external testimony as one of their factors, are severally governed by the "personal equation" which constitutes the other factor,—namely, *that antecedent mental state* which really settles the value to be assigned to the external testimony, by what it regards as the inherent probability or improbability of the fact, and thus indirectly determines the "preponderance of evidence." Either may, if he thinks proper, accuse each of the two others of being "prejudiced" in favour of his own particular belief; but the "prejudice" is simply, in each case, a resultant of previous training. I, on the one hand, who accept the scientific explanation, have no right to charge the devout Catholic with absurd superstition, because, having been brought up in the belief that miracles are worked at the present day for the authentication of Divine truth, he accepts this particular case as belonging to the "miraculous"

category; but he, on the other, is not entitled to brand me as a sceptic or an infidel, because, having been brought up in the belief that the age of miracles has ceased, my scientific studies lead me to a rational explanation of the facts which I agree with him in accepting. I may fairly, however, deny the right of his Protestant opponent to question either the honesty or the competence of witnesses, whose prepossessions were obviously rather against than in favour of the genuineness of the phenomena; merely because, while refusing to admit their "miraculous" character, he has not given sufficient attention to the body of evidence relating to the influence of mental upon bodily states,* to be able to recognise their "naturalness."

I would now ask you to accompany me in the examination of a still more remarkable phenomenon, which attracted considerable attention some years ago, but of which nothing (so far as I know) has been lately heard; that, namely, which the late Mr. Braid of Manchester termed "Human Hybernation." It is known to most persons who have resided long in India, that certain Hindoo devotees are reputed to have the power of passing at will into a condition of death-like torpor, and of remaining for days or even weeks in that condition without the loss of their vitality, so that they may be resuscitated by appropriate means, although they have been all that time buried so securely in a vault, as to be absolutely cut off from supplies of food, and almost entirely secluded from air. But I suppose that there are few who have regarded such statements as deserving of any serious attention; the wonderful jugglery by which the celebrated "tree trick" is performed, being, it may be supposed, quite adequate to impress witnesses of no extraordinary penetration, with a belief in the genuineness of phenomena that were merely contrived for the purpose of deceit. But

* See Dr. Tuke's work on the *Influence of the Mind on the Body*.

the narratives which Mr. Braid obtained from witnesses not only of unimpeachable veracity but of the fullest competence, to whom every facility for the most careful scrutiny was accorded, put the matter in an entirely different light. In one of these cases, vouched for by Sir Claude Wade, who was long our political agent at the Court of Runjeet Singh, the Fakeer was buried in an underground cell for six weeks ; and having been twice dug out by Runjeet Singh during that period, was found on each occasion in precisely the same condition of apparent death as when first buried. In another case, mentioned by Lieutenant Boileau, in his *Narrative of a Journey in Rajwarra*, in 1835, the man had been buried for ten days, in a grave lined with masonry and covered with large slabs of stone, and strictly guarded ; and he assured Lieut. B. that he was ready to submit to an interment of a twelvemonth's duration, if desired. In a third case, cited by Mr. Braid, the trial was made under the direct supervision of a British Resident, a period of nine days having been stipulated for on the part of the devotee ; but the Resident, fearing that he might incur blame if the result should be fatal, had the Fakeer dug out on the third day, without any previous notice. In each case we have the testimony of British medical officers as to the condition of the body when exhumed ; and in this all the narratives agree. Its appearance was perfectly corpse-like ; no pulsation could be detected either in the heart or in the arteries (there was no stethoscopy in those days) ; and there were no perceptible movements of breathing. The means of restoration employed by the attendants of the Saint were just what we should ourselves employ in a case of "suspended animation ;" namely, friction of the surface, the application of warmth, and the administration of stimulants as soon as the power of swallowing returned.

Still it may be said that it is so intrinsically improbable

not to say impossible, that a state of apparent death could be self-induced in the first instance, and could then endure for weeks (to say nothing of months) without the absolute loss of vitality, that it is more likely that even these most competent and trustworthy witnesses were deceived, than that the facts really happened as narrated by them. And a determined sceptic might feel himself justified in likening their narratives to the wonderful stories told by Marco Polo, as to the chain thrown up into the air, the climbing-up of this chain by a boy until he was out of sight, the falling to the ground of his head, body, and limbs in separate pieces, and their spontaneous reunion, so that the boy got up and walked alive and whole in the presence of a circle of spectators.

But the scientific Physiologist, as in the preceding instance, sees a clue to the rational explanation of the cases of the buried Fakeers, which leads him to view the testimony given in regard to them by the cautious, sceptical, and well-informed witnesses who vouch for them, in a very different light from that of the wonder-loving traveller of the middle ages.

In the first place, the state of "suspended animation" or "apparent death" is one of which the existence cannot be denied; since it is continually produced by drowning, and sometimes occurs spontaneously. And that such a state might be maintained in India under the circumstances described, for a much longer period than in this country, may be fairly attributed to the warmth of the tropical soil; which will prevent any considerable reduction of the temperature of the body buried in it, notwithstanding the almost entire suspension of its internal heat-producing operations. Again, it has been experimentally ascertained that even warm-blooded Mammals, whose hybernation is profound, can be kept under water for an hour or more without injury;

although, in their ordinary condition of activity, they would be killed by a submersion of three or four minutes. And thus there is nothing in the almost complete privation of air, that militates against the probability that the buried Fakeer might remain enclosed in a narrow vault, without suffering from the want of it ; for the nearly complete suspension of all the functions of life will reduce the demand for air, as for food, almost to zero.

But, secondly, there is to the well-informed Physiologist no inherent improbability in the self-induction of this curious condition. For, in the first place, he has the standard case of Colonel Townsend, which no medical authority has ever ventured to call in question, so high was the authority of Dr. Cheyne, the eminent physician by whom it was recorded. And Mr. Braid, in the course of his experiments on that form of artificial Somnambulism which he termed Hypnotism, met with several cases (of which I myself saw more than one) in which the self-induction of that state produced a marked lowering of the pulse and respiration ; the reduction being such in one instance as seriously to alarm Mr. Braid, and to necessitate the immediate termination of the experiment.

The inherent improbability of the asserted phenomena, then, being thus weakened or even removed by Scientific inquiry, we are free to attach whatever weight to the testimony in their favour we may think it deserves on its own account. And I long since expressed my own conviction, that though we may scarcely accept that testimony as affording a satisfactory basis for positive assurance, we have no right whatever to refuse to believe it. The case seemed to me to be one fairly calling for that "suspension of the judgment," which our great Faraday used to advocate, as preferable in many instances to that premature "making up of our minds," which often involves either our *un*-making

them again at some subsequent time when fresh evidence has been adduced, or our persistence, from mere obstinacy, in a belief which we should not have adopted in the first instance, if the whole case had been then before us.

But having happened some years ago to speak on the subject to Prof. Max Müller, I learned from him the additional very important fact, that this condition of self-induced suspension of vital activity forms, as it were, the climax of a whole series of states, with two of which I was myself very familiar — “Electro-biology,” or artificial Reverie, and “Hypnotism,” or artificial Somnambulism (both of them admirably studied by Mr. Braid, through whose kindness I had many opportunities of investigating their phenomena); the self-induction of which, practised by the Hindoo devotees, is part of a system of Religious Philosophy which is termed the Yoga: and by the kindness of Prof. Max Müller I possess a very curious account of this Philosophy, printed at Benares twenty-two years ago, by Sub-Assistant Surgeon Paul, who had carefully studied it. It appears from this that the object of the whole system is to induce a state of mystical self-contemplation, tending (as these Hindoo Philosophers believe) to the absorption of the soul of the individual into the Supreme Soul, the Creator, Preserver, and Destroyer of the World; and that the lower forms of it consist in the adoption of certain fixed postures, which seem to act much in the same way with the fixation of the vision in Mr. Braid’s methods. The first state, *Pránáyāma*, corresponds very closely with that of Reverie or Abstraction; the mind being turned in upon itself and entirely given up to devout meditation, but the sensibility to external impressions not being altogether suspended. The second state, *Pratyáhára*, is one which — the external senses being closed, while the mind is still active — corresponds with some forms of Somnambulism. Those who have attained the power of

inducing this condition, then practise Dharána, a stage of complete quiescence of body and mind, corresponding with what is known as Catalepsy,—the body remaining in any posture in which it may be placed. From this they pass into the Dhyána, in which they believe themselves to be surrounded by flashes of external light or electricity, and thus to be brought into communion with the Universal Soul, which endows them with a clairvoyant power. And the final state of Samádhi, which they themselves liken to the hybernation of animals, and in which the respiratory movements are suspended, is regarded as that of absolute mental tranquillity, which, according to these mystics, is the highest state which Man can attain ; the individual being absolutely incapable of committing sin in thought, act, or speech, and having his thoughts completely occupied with the idea of Brahma, or the Supreme Soul, without any effort of his own mind.

From this point of view, then, the history of the buried Fakeers presents a new significance ; for so far from being an exceptional phenomenon, this self-induced state of suspended animation is one towards which the whole of their system of Religious Philosophy tends, and for which it provides, as it were, both the physical and the mental education. And the evidence thus derived from an entirely independent source, of the inherent probability of occurrences whose narration at first called forth nothing but incredulity, seems now, in my judgment, sufficient to give a very decided preponderance to the scale of positive belief.

Now it is obvious that the state of Belief of each one of yourselves, to whom the subjects of the three cases I have now discussed may be entirely new, will be mainly determined by the confidence you may be severally predisposed to place in *my* scientific knowledge. You may reasonably conclude that, although not a professed Physicist, I should not

declare to you my conviction that a man may hold his hand unharmed in a stream of molten iron, without having the strongest grounds for that assurance, which the confirmation of *à priori* scientific probability can furnish to the testimony of competent and unprejudiced witnesses. And those of you who may know me not only as a Physiologist, but as one who has for thirty years made a special study of the border-ground between Physiology and Psychology, will perhaps be disposed to think that I should not, without adequate reason, speak to you of the stigmatisation of Louise Lateau, and of the buried life of the Hindoo Yogé, as not to be lightly put aside as cheats, but to be entertained as matters of serious investigation. In each of these cases, however, the question is obviously one as to which the decision between Testimony and the dictates of Common Sense depends upon *special* knowledge ; the negative verdict which almost every person of average intelligence would almost unhesitatingly pronounce, being liable to reversal by the lightening of the scale of general experience, whilst fresh weights are put by special investigation into the scale of testimony. And the "personal equation" which determines the belief of each individual who does not work out the inquiry for himself, here consists mainly in his confidence in the knowledge and judgment of another person. The evidentiary facts on which his scientific guide relies, may be utterly meaningless to himself ; but he accepts them, as the merchant would a bill of exchange, on that guide's assurance of their worth ; and the "preponderance of evidence," like the balance of an account, is decided accordingly. If any one who is either disqualified by ignorance from rightly appreciating the value of the evidentiary facts, or is unwilling to take the trouble of investigating the case, claims to dispose of it in an off-hand way in accordance with his "common-sense" notions, we, who *have* studied the subject, take leave to tell him that it is

a case requiring the *uncommon* sense which only special culture can bestow, and without the possession of which his judgment is altogether worthless.

But I have now to direct our inquiry to that class of Beliefs, which relate to matters lying within the scope of ordinary Reason, upon which every thoughtful man feels himself not only competent but called upon to decide for himself, and yet as to which there is no less a diversity in the judgments formed upon the same evidence, than there is in the cases we have already considered.

While the world has been too ready to charge with Moral culpability those who depart from the beaten tracks of Religious or Scientific orthodoxy, independent thinkers seem to me to have often been unjust as well as unwise in flinging back the accusation, and in imputing to those whose mental development has taken place under a particular system, and whose whole Intellectual and Moral nature has shaped itself into conformity with that system, either a wilful blindness to evidence which at once carries conviction to their own minds, or an intellectual incapacity to appreciate it. For, as I shall now endeavour to show you, the ordinary Beliefs of every individual are mainly determined by a "personal equation" not less definite than that of the man who has studied some particular subject, though it is the resultant rather of his *general* than of his *special* culture. Here we shall find it convenient to resume our former comparison, and liken the Mind of each individual to an Edifice,—palace, dwelling-house, or cottage, as the case may be,—which, though partially furnished, still has some of its rooms entirely empty, while in others there are recesses, nooks, and corners remaining to be filled, or perhaps only a few pegs on which some lighter articles may be loosely hung.

Now it seems to me that our immediate acceptance or

rejection of the Propositions daily coming before us, as to which our judgment does not need to be *specially* informed, but which the *ordinary* Common Sense, or “acquired instinct,” of an average man is quite competent to decide, is determined on exactly the same principle as our acceptance or rejection of (let us say) a bookcase, which may be offered as likely to suit a certain recess in our library. For just as our decision is guided in the latter case by the *fitting-in* of the piece of furniture to the vacant nook, so does our intellectual *assent* to a new proposition depend upon its *fitting-in* to some appropriate place in our existing Fabric of Thought. The *fit* of this new bookcase may be so perfect, that we have no question whatever about retaining it; and it gradually, by use and habit, becomes to ourselves as much a part of the library, as if it had grown into its walls. And so a new Belief, for which an appropriate place is ready in our Fabric of Thought, and which precisely fits in to that place, not only obtains immediate acceptance, but ere long (if not called in question) is adopted into the fabric itself.

But, again, the “fit” of the bookcase may not be perfect in the first instance, and yet we may think so well of its general suitableness as not to like to let it go; and we then consider whether by some slight alteration, either of the bookcase or of the recess, we can bring about an adjustment. If this can be done, we keep the bookcase; if it cannot, we send it back. Even so, the new Proposition may not in the first instance find any place in our Fabric of Thought into which it can be received; and yet its want of accordance may be so slight, as to lead us to examine whether we cannot make it fit by some process of accommodation;—either our recess being widened by argument and discussion, or the proposition being narrowed by the limitation of its terms. If we can thus bring about a satisfactory “fit,” we accept the proposition as part of our Intellectual furniture; if not, we dismiss it,—at any rate for a time.

Now in this Intellectual judgment, it seems clear to me that the Will is no more involved at the moment of making it, than it is in that which is determined by the "preponderance of evidence." For if there be a complete suitableness, or a complete unsuitableness, between the new Proposition and the vacant recess in our Fabric of Thought, we accept it without hesitation in the one case, we feel compelled to reject it in the other. So far, then, it is true that "we are no more responsible for our opinions, than we are for the colour of our skin." But, whenever the proposition comes to be a subject of *discussion*,—when we are canvassing the practicability of fitting it into our recess,—the Will has exactly the same indirect influence over the result, that it exerts when we are formally trying the proposition on its merits. And even when we have no desire to find a verdict in its favour, we are, perhaps, not unfrequently biassed unconsciously by a disposition to bring the new Belief into accordance with the old. Knowledge, when its *fit* is *all but* exact.

But we must now carry this inquiry a step farther back ; and consider where the responsibility lies for the *construction* of that Fabric of Thought, the shape and dimensions of whose recesses determine the admissibility of the Beliefs that constitute its furniture.

The general plan of that fabric may be said to be determined by our congenital Constitution. Every individual is, in the first instance, what Nature made him ; and however much his capacities and tendencies may be developed and modified by subsequent influences, these cannot build up any superstructure that was not, as it were, sketched-out in the original design. The foundations are laid, and the basement-storey reared, by the education and training we receive ; and while we are in no degree responsible for this in the

first instance, we gradually come to be so more and more, as we acquire that power of Volitional selection, by which we can regulate the action of our Intellectual faculties, and determine the choice of its objects,—so far, at least, as this may be left to ourselves. But it is during this period of our lives, that we are most powerfully, though unconsciously, influenced by that *aggregate* of external influences which the ancient Greeks designated as the *Nóμος*,—a term we sometimes translate as “custom” and sometimes “law,” and which may be considered as expressing that custom which has the force of law, and which has become so completely a “second nature” as to be less easily changed than any written law. Of this *Nóμος* the “caste” of India is doubtless the most conspicuous example; but no observant mind can fail to recognise the applicability to our own social condition, of the admirable account given by Mr. Grote of the Greek conception of that “King of all” (to borrow the phrase cited by Herodotus from Pindar), which

“Exercises plenary power, spiritual as well as temporal, over individual minds; moulding the emotions as well as the intellect, according to the local type,—determining the sentiments, the belief and the predisposition in regard to new matters tendered for belief, of every one,—fashioning thought, speech, points of view, no less than action,—and reigning under the appearance of habitual, self-suggested tendencies.” — (*Plato and the other Companions of Sokrates*, vol. i. p. 249.)

The Physiologist who believes that the Brain is shaping itself during the whole period of Growth, according to the mode in which it is habitually exercised, and that the nerve-tracks then laid down are maintained through life, even though disused, far more persistently than any which result from subsequent mental modification, will most fully realise to himself the extreme importance of this *Nóμος*,—the influence unconsciously exerted by the family life, the public

opinion of the school and college, and the usages and habits of thought and feeling of the particular social class as a member of which the youth makes his first entrance into the world,—not only in moulding the Moral character, but in building up the Fabric of Thought. And it operates in this special way,—that it shapes our Mental recesses to the forms and dimensions of certain ancestral pieces of furniture that are awaiting to be put into them; so that as the Fabric is growing up, and one room is ready after another, these respectable Beliefs find their appropriate places; the recipient never dreams of questioning their inherent use and value, because they “fit” in so perfectly; and so long as nothing occurs to make him doubt the security of his walls, and he does not experience any special inconvenience from the antique awkwardness of his furniture, he continues to give it a place, to the exclusion of articles of newer fashion and more attractive exterior.

In so far, then, as the Fabric of Thought of each individual has been built up by influences external to himself, he cannot be regarded as in any sense responsible for his acceptance of Beliefs which that fabric has been shaped to receive; but he does become responsible, when the time comes for him to think for himself, to examine into the foundations of his Knowledge, to test the goodness of its materials, and to try the security of its construction. Anyone who is restrained from doing this, whether by passive indolence, or by timorous apprehension of the possible results of inquiry, either to his own worldly interests or to those of others, is liable some time or other to find his fabric of thought overthrown, and himself buried in its ruins; and even though no wave should dash, no lightning-flash should shatter, it may ultimately fall to pieces from sheer decay. Everyone, on the other hand, who recognises his obligation to make the best use in his power of the faculties with which

he finds himself gifted, and who looks at the search for Truth as his noblest object, the attainment of it as his most glorious prize, will be constantly on the watch for opportunities of *improving* his fabric of Knowledge, and of perfecting its furniture of Beliefs. Now, in doing this, he will find that as his fabric is altered (or rather, alters itself), his furniture must be changed in accordance with it; for the enlargement of one of his apartments may enable him to give place to some article which he was formerly obliged to reject, whilst the reduction of another may crowd out the fittings which were once most perfectly suited to it. Every one who has gone through a sufficiently long course of Intellectual experiences, and has been accustomed to reflect upon them, must be conscious that this has often occurred to himself. He is surprised, on turning over the records of his earlier Beliefs, to find how many of them he would now absolutely reject; not because they have been disproved by additional evidence, but because *he has himself grown out of them.*

And it is, further, by the use of the power which every man possesses of *enlarging*, as well as improving, his Fabric of Thought, by applying himself to the acquirement of new Knowledge, that he gains a vastly increased capacity for the reception of a nobler and grander order of Beliefs, such as he would have previously thought it impossible that he could ever come to possess.

Suppose an American Professor to have come over, a dozen years ago, to announce to the Scientific public of Europe, that he had devised and perfected a method by which he was enabled to determine the presence of many Chemical elements, not only with positive certainty, but with such immediateness as no ordinary process would permit, though their quantity might be less than the *hundred-thousandth of a grain*; that he had in this way discovered *three new Metals*;

that he could recognise in the incandescent atmosphere of the Sun a large number of the component elements of our own globe ; that he had discovered the most notable of these to be Hydrogen, which, heated to redness, forms a glowing envelope ordinarily at least 5,000 miles thick, whence fiery tongues are shot forth from time to time, sometimes to the height of 50,000 miles in a few minutes, their disappearance being often as rapid as their projection ; and that he had ascertained the sun-spots to be the centres of circular storms, sometimes revolving at the rate of 120 miles per second, which are set in motion by a downward rush of metallic vapours, dependent on a local cooling that can only be measured by thousands of degrees ; — what would have been our mental attitude ? These propositions would to most of us, whether scientific or unscientific, have seemed so completely inadmissible into our Fabric of Thought, that we should have suspected our American friend of amusing himself by trying upon us one of those ingenious hoaxes for which his countrymen have shown a special aptitude.

Let us suppose our Professor to have further assured us that he was able by the same method to determine the existence of many of the Terrestrial elements even in the Fixed Stars ; that he had found Hydrogen not only to be universally present, but to perform the leading part in those changes which give rise in certain cases to the known variations in their brightness (a star previously invisible to the naked eye suddenly blazing out with a lustre surpassing that of Jupiter, and declining almost as rapidly) ; and that he was further able to prove that many of these luminaries have a motion of approach-to or recession-from us, such as no measurement of their angular positions could detect, no telescopic scrutiny would lead us even to surmise, though its rate may be fifty miles per second ; — we should scarcely have been unreasonable in regarding his statements as inge-

nious inventions, devised to try how far our credulity might extend.

And if, not satisfied with this, he had ventured a still higher flight, and had assured us that he had obtained by the same simple method the solution of that grand Astronomical problem,—the constitution of the Nebulæ,—which the ablest observers, armed with the largest and most perfect instruments, had declared to be beyond their ken; and that he could classify the irresolvable nebulæ with certainty into those which are mere whiffs of vapour, and those which are aggregations of Stars too remote to be separately discerned;—we should, I think, have begun to respect his imaginative power for the sublimity of its conceptions, while the extravagance of this last assertion would have seemed fully to justify our repudiation of the whole series, as utterly destitute of any claim on our belief.

But suppose that our Transatlantic visitor, instead of laying his claims before an incredulous Public, had privately brought together some half-dozen of the most eminent Physicists of Europe, who were acquainted with all that had been previously learned as to the constitution of the Solar Spectrum, and the modifications produced in flame by the presence of certain Chemical elements;—he would have been able in a brief space, not only to satisfy them of the soundness of his basis, but to erect upon that basis a new and substantial addition to their Fabric of Knowledge, culminating in a lofty “heaven-kissing” tower, of which every stone should be so firmly and variously knitted to every other, as to leave no room for any suspicion of insecurity. And when they had, by the strictest methods of observation and experiment, verified his statements—step by step—as to all those facts which are capable of direct demonstration, and had also become fully assured, in the course of their inquiries, of their visitor’s personal good faith, they would

have found no difficulty in crediting his accounts of those Celestial marvels of rare occurrence, which it would be altogether beyond his power to reproduce.

I do not know any more remarkable fact in the Psychology of Belief, than the universality with which even the most wonderful—I might say the most romantic—results of Spectrum Analysis have been accepted as sober truth, not merely by the whole Scientific World, but by the general Public. And this universality is, I think, to be attributed to these two conditions:—first, that the absolute concurrence of Scientific men on this subject gives to their statements the value (if I may so express myself) of Bank Notes, which any one may convert into the Standard Gold of personal knowledge, merely by enquiring into the matter for himself;—and secondly, that these results are additions to our previous Knowledge, and do not run counter to any established Beliefs. But suppose they *had* done so, would they have been the less true in themselves, or have possessed any the less claim on universal acceptance? The old Beliefs would clearly have had to give place in this instance, as they have had to do in many previous cases, to the new Knowledge.

With one more practical application of this method of studying the Psychology of Belief, I must bring this Discourse to a conclusion.

I alluded at its commencement to a great Scientific Hypothesis, which is now on its trial at the bar of public opinion, and which, if adopted as a principle of construction, will give a new shape to a large part of our Fabric of Thought; and I would say a few words of what seems to me the spirit in which that trial should be conducted. There are many of our securest Beliefs, which depend on the convergence of a number of separate *probabilities* towards a

common centre, while none of them are complete as *proofs*; the whole of what is commonly termed "circumstantial" evidence being, in fact, of this character. And just as the value of the "circumstances" depends on the testimony of experts,—a case of Poisoning, for example, requiring the analysis of the Chemist, and the examination of the morbid appearances by a Pathologist,—so must the hypothesis of Evolution be ultimately either established or disproved by its accordance or disaccordance with a vast aggregate of facts of Nature, which belong to different departments of Scientific inquiry. The Geologist traces the succession of Plants and Animals in Palæontological order, and finds, as he advances in his studies, less and less evidence of interruption, and more and more of continuity, Biological as well as Physical. The Zoologist and Botanist, who have been accustomed to classify their multitudinous and diversified forms of Plants and Animals according to their "natural affinities," find a real meaning in their Classification, a new significance in their terms of relationship, when these are used to represent what may be regarded with probability as actual community of descent. The Morphologist, who has been accustomed to trace a "unity of type" in each great group, and especially to recognise this in the presence of rudimentary parts which must be entirely useless to the animals that possess them, delights in the new idea which gives a perfect *rationale* of what had previously seemed an inexplicable superfluity. And the Embryologist, who carries back his studies to the earliest phases of Development, and follows out the grand law of Von Baer, "from the general to the special," in the evolution of every separate type, finds the extension of that law from the individual to the whole succession of Organic Life, impart to his soul a feeling of grandeur, like that which the Physical philosopher of two hundred years ago must have experienced, when Newton first promulgated

the doctrine of Universal Gravitation. And lastly, when the doctrine of Evolution is looked at in its Intellectual and Moral aspect, as one which leads Man ever onwards and upwards, and which encourages his brightest anticipations of the ultimate triumph of Truth over Error, of Knowledge over Ignorance, of Right over Wrong, of Good over Evil, who shall presume to say that the convergence of all these great lines of Thought, each of them the resultant of the patient toil of a whole army of Scientific workers, is a fact of no account? *Absolute* truth, no man of Science can ever hope to grasp; for he knows that all human search for it must be limited by human capacity. But he denies the right of anyone else to impose upon him, as "absolute truth," his own fallible exposition of the Revelation conveyed in the teachings of Religiously-inspired men; for *he* claims an equal right to be accounted a true expositor of the Revelation conveyed in the Divine Order of the Universe, by use of that "understanding" which is given him by "the inspiration of the Almighty." And the real Philosopher, who fixes his hope on a perpetual approximation to that absolute Truth which he may never actually grasp—who, "forgetting those things which are behind," is always "reaching forth to those which are before,"—who "tends towards perfection, without ever pretending to it,"—and who is constantly striving upwards, so as either himself to reach, or to help his successors to reach, a yet loftier elevation,—believes that he is thus best fulfilling his duty to the Great Giver of his own powers of Thought, and to the Divine Author of that Nature in which he deems it his highest privilege to be able to read some of the thoughts of God.

ON THE
AUTOBIOGRAPHY OF JOHN STUART MILL.

By EDWARD R. RUSSELL.

I HAVE felt a strong desire to strew a few flowers on the memory of one in whom many of his countrymen have found a great benefactor and example, and in whom the world has lost one of its calmest and wisest guides; and it seemed to me that none could be more beautiful or fragrant than I might gather in the last garden he ever planted. After I had undertaken, however, to read a paper on the *Autobiography* of John Stuart Mill, a fear came over me that it might appear a slight to a literary and philosophical audience, to condense a book which was already too brief, to popularise what was already the perfection of simplicity and vivacity, or to commend what must commend itself to the admiration of all who can recognise nobleness.

To my relief, while under this impression, came a review of the *Autobiography* in the *Times* newspaper. It was written, not by the usual reviewer of that journal, who fishes up novels that no one knows or need know, and pays them honours of space and type which, in their obscure days, were denied to Thackeray and George Eliot, but, as I have no doubt, by a veteran and powerful hand. The gentleman whom I take to be the author of the *Times* review is an incarnation of worldliness, tinctured by letters and thought. He is an exquisite and rigorous judge of the most *recherchés* dinners, and yet he is not a bad judge of philosophy. He knows the *cru* of wit as well as of wine. He cannot speak of a subject that really arouses noble emotions, without

irritating those who are capable of experiencing them; yet he is too thoughtful, too sympathetic, too variously cultivated to be prohibited any subject whatever; and he guards himself too well to be accused of utterly misconstruing or befouling that which it is his mood to caricature. Moreover, he has the happy, or unhappy, Palmerstonian faculty of making his audience feel that a low view of a subject is agreeable and satisfactory, and that to rise above it would be gratuitous if not morbid sentimentality. All this gives him a power over common readers which it is most unfortunate that a writer of low tone should possess.

Nothing is more amusing to him than Mill's education, except Mill's opinion of his wife. Nothing is more ridiculous in his eyes than Mrs. Mill, except her husband's political career. This is not surprising. The *Times* reviewer would have pooh-poohed the Garden of Eden. I am not astonished that he should sneer at Mill's biography. Such articles, however, lower the whole tone of a generation. They nip, with the deceptive playfulness of a bright frost, the buds of high feeling and generosity which have come out in the sunshine of a great example. They ought to be dealt with, and I am here to deal with this one, not by answering it — that were unworthy — but by reasserting the simple majesty of one of the purest lives that ever illustrated philosophy.

The *Times'* critic has not stood alone. Less cunning hands have in various publications endeavoured to derogate from Mill's fame; and a clumsy libeller in *Fraser's Magazine* has appealed, not unsuccessfully, to prejudices which Mr. Froude, its editor, ought to scorn. The world is reminded by him that Mr. Gladstone fell away from his allegiance to Mill's memory soon after his death. Mill's memory will survive in full lustre so inconsiderable, and probably so hastily committed, an indignity; but in the

meanwhile, as Mr. Gladstone always has time for letter-writing, one would like to know what particular fault of the departed philosopher it was that provoked his prime-ministerial wrath, strangely contrasting as it did with the almost obsequious reverence exhibited towards Mr. Mill by Mr. Gladstone during his parliamentary service. The mere mention of such a fact in an article pretending to be critical sufficiently displays the poor spirit in which it is conceived; and this is not the only reason for saying that the paper in *Fraser* is one of the meanest ever written. What ability there is in it is contemptibly misapplied; points are taken that are not worth notice, others are ignored upon which everything depends; and without even the bad merit of forensic ingenuity, an utterly false impression is given as to several aspects of the *Autobiography*.

I dwell for a few moments on these malignant manifestations, because they are accounted for by certain unfortunate public impressions against which it is my wish to protest. The great value of the *Autobiography* lies in its piecing out and harmonising a life of which various opinions were formed at various periods. Mill disappointed in succession the Benthamites, the Philosophical Radicals, the Economists, the Conservatives, and the Liberals, besides displeasing, at various times, the Sentimentalists, the Unsentimentalists, the Religious, the Secularists, and a great variety of irregular cliques and sections. He would not have been so admirable if he had *not* offended them. And it was natural that, as soon as the shock of his death was over, as many of his enemies as could find common ground on which to stand should join in crying him down. I invite you to stand aside from this crowd, and to perceive the golden thread of enlightened goodness which, now that the career it held together is folded up as a vesture, is coiled

gracefully for us by loving hands, and casketed within the covers of this book.

Only two things need be premised. The first is that, though a general admirer of Mill, I am not necessarily his follower in any single particular. My own adhesion to, or rejection of, his opinions is immaterial to the view I shall take of him. My critics, if they argue from the essential objectionableness of anything he has said, will have first to prove that the intrinsic faultiness of the doctrine they find fault with militates against the general excellence of his intellectual methods. Secondly, I shall not presume to defend Mill's rank amongst the economic, the political, and the psychological philosophers of his day. If he is not chief I know of none who can dispute the place with him. But any attempt to degrade him from that position must be met by other means than a review of his *Autobiography*. In telling this story of his own life, he tells us how he became what the world supposed him to be. The explanation is complete, and justifies the verdict long since passed on his claims as a philosophical writer. Any treatment of Mill's philosophical genius which goes beyond this limitation is alien from my present purpose. I take his status for granted, and shall not defend it. Apart from his status as a scientific authority, I take him to have made the nearest approach ever achieved to the greatest of all sciences — the science of being right on all subjects; and if the *Autobiography* can illustrate his method to a single reluctant hearer, it has not been written in vain.

Mill has been treated on the principle of exciting horror by rudely stating his conclusions. No such horror can be felt by any one who has been shown, not only those conclusions, but the exquisite seductive demonstrations by which

they were reached. Not only does Mill lead you along perilous paths with the light step and firm hand of a perfect guide. By some mysterious charm,—or rather by a charm wholly without mystery, the charm of a perfectly balanced, freely opened mind, to which candour is no effort, but as unconscious as healthy breathing,—he banishes from his pupils and companions all sense of danger. He inspires them with a grand serenity, which never errs in over-confidence, or diminishes their circumspection, but which is to the mind of the enquirer, on the heights or in the quagmires of speculation, what a sound body and freedom from care are to the mountaineer or the adventurer.

And if this is the experience of those who study his writings, how clearly they will comprehend it when they read his life. “I had always,” says he (p. 242), “a humble opinion of my own powers as an original thinker, except in abstract science (logic, metaphysics, and the theoretic principles of political economy and politics), but thought myself much superior to most of my contemporaries in willingness and ability to learn from everybody; as I found hardly any one who made such a point of examining what was said in defence of all opinions, however new or however old, in the conviction that even if they were errors there might be a substratum of truth underneath them, and that in any case the discovery of what it was that made them plausible would be a benefit to truth.”

The value of the *Autobiography* lies in its making clear to us the perpetual fidelity of Mill to this principle; in telling us from whom and how he learnt his “taught” opinions, and whence and how he acquired in rapid succession those new facts and views by means of which, in his own language, he incessantly wove anew, without ever allowing it to fall in pieces, though it constantly gave way in many fresh places, the first fabric of his beliefs.

In the recital of the earliest portion of his mental experience, the Autobiographer is accused of being unnaturally cold, as in the latest portion he is charged with being absurdly sentimental. It is most scandalously stated that he represents his father as a monster of severity, besides barely mentioning his brothers and sisters, and never naming his mother. Because the world is not troubled by John Stuart Mill, about his infantile affections, it is supposed he had none. In the cant of gushing criticism, the book is voted "sad" and unnatural, because Mill does not leave on record the nicknames of his little brothers, or the prattle of a particularly dull nursery. The very people who think it almost fatuous in him to cherish the memory of a wife who was all in all to him and to his work, are lost in amazement that in his sixtieth year he did not shed tears over the memory of his mother. It is surely not necessary to remind this audience, though pretentious literary authorities have forgotten it, that the book is only intended to illustrate the formation of the writer's mind. The characters to figure in its pages are those who contributed to the formation of that mind, and not persons who had no influence on it whatever.

But even if the *Autobiography* had had a more general intention, the omission of most of these personal domestic topics would probably have been not only permissible, but requisite to honesty. From a dedication of a pamphlet by Mr. Christie to the memory of Mill's younger brother, James, it would appear that this young man was worthy of his kinship; and no one who reads this book can doubt that the love and veneration he showed to John Mill would be responded to with great affection. Others of the family may have resembled him, and might have found a natural place in a biography of less purely intellectual purpose; but as to Mrs. Mill—the wife of James and the mother of

John — almost any sort of biography would have had to be silent, or to speak in terms which must have seemed ungraceful. She has been described to me as “an imbecile, shiftless, aimless sort of woman, incapable of sympathy with any one, having no power whatever beyond the bearing of frequent children, whom she neglected from the moment of their birth.” Others are free to say this when provoked ; but Mill was not. The world must be very hard to please, if it exacts from an autobiographer, as a passport to its favour, hypocritical encomium or conventional filial unction in reference to a mother of this sort. We are always crying out for honest autobiographies ; let us not turn and rend a man who is sincere at least to the extent of keeping silence when he cannot truthfully adopt language of affectionate remembrance. The veneration paid, almost as a matter of course, to the mothers of great men is something much better than a superstition. It is founded on a presumption largely if not almost universally supported by facts. But it would soon disappear, even as a superstition, if every eminent autobiographer was expected to sweeten the story of his life by a panegyric on his mother, without reference to her deserts.

We heard, the other day, in this Society, of certain cases in which the ordinary rule of sex as to the nutrition of the young was reversed. However mythical this may be in other instances, it is literally true of the mental nutrition of John Stuart Mill. From the first moment to the last of his tremendous juvenile education, which began, and had even reached the learning of Greek, before an age at which not a few children can hardly speak, James Mill, his father, was the one only living channel through which he obtained instruction. Under his father's tuition, he learnt Greek and Latin, and read more or less of Homer, Xenophon, Demosthenes, Diogenes Laertius, Aristotle, Lucian, Theocritus,

and Plato ; Virgil, Horace, Phædrus, Sallust, Ovid, Lucretius, and Cicero. With his father he discussed, in their daily walks, Robertson, Hume, Gibbon, Watson, Rollin, Burnet, Plutarch, the *Annual Register*, Mosheim, Millar, McCrie, the *Arabian Nights*, the tales of Miss Edgeworth, and several selected books of travel. At his father's instance he wrote histories and English verse. He devoured numerous treatises on Chemistry, mastered Adam Smith and Ricardo before he was fourteen, and at twelve years old was occupied daily, as he walked with his father, in answering searching questions on the School Logic. To this study he attached a justly vast importance. Mathematicians will no doubt say it was because he progressed no great distance in Mathematics that he pronounced them comparatively useless in forming exact thinkers, since "in mathematical processes none of the real difficulties of correct ratiocination occur." But he went, in some sort, through Geometry, Algebra, the Differential Calculus, and other branches of the higher Mathematics.

At every stage of this almost unprecedented course of instruction, infinitely more troublesome to direct than the ordinary routine of school studies, the busy, hard-working father,—writing himself, laboriously, and with but little present hope, into fame and place,—was almost hourly at his son's side, strictly challenging every acquisition of his mind. "He strove," says John Mill, "to make the understanding not only go along with every step of the teaching, but to precede it. Anything which could be found out by thinking, I was never told until I had exhausted my efforts to find it out for myself." And when the suggestion forces itself upon the son's mind, that the father was unreasonable, he adds, "but only in being angry at my failure. A pupil from whom nothing is ever demanded that he cannot do, never does all he can."

Fathers of families, who are engaged in commerce or public business, and to whom literature, and even the supervision of their children's education, may be a pleasant and valued recreation, can hardly appreciate the severity of James Mill's system, not as towards his son, but towards himself. To understand his endurance and his elasticity, one must be able to look back upon early years spent in an exhausting, precarious, and yet constantly pressing literary occupation; with young children around one, in a humble and perhaps necessitous homestead, whose opening minds and fallow faculties, instead of inspiring one to such devotion as James Mill's, were either thoughtlessly neglected amidst the wearing work of anxious days and nights, or, if observed, only tended to make those days and nights more depressing, by striking coldly to the heart a sense of the impossibility of either getting for or giving those children the education necessary to bring them even to one's own intellectual level.

It was under such circumstances that James Mill created the wonderful boy whom he started "with an advantage of a quarter of a century over his contemporaries." Allowing the utmost latitude for loose learning, and even for exaggerated recollections of the quantity learnt, this is a fair estimate of the lad James Mill's system produced — at what a sacrifice let any working literary man judge who reads this passage: "What my father," says Mill, "was willing to undergo for the sake of my instruction, may be judged from the fact that I went through the whole process of preparing my Greek lessons in the same room and at the same table at which he was writing; and as in those days Greek and English lexicons were not, and I could make no more use of a Greek and Latin lexicon than could be made without having yet begun to learn Latin, I was forced to have recourse to him for the meaning of every word which I did not know. This

incessant interruption, he, one of the most impatient of men, submitted to, and wrote under that interruption several volumes of his *History*, and all else that he had to write during those years."

To imagine that, if John Mill had lived to be a hundred years old, he would have been wanting in gratitude to such a father is impossible. There are some basenesses which cannot be conceived, and this is one. But it is imputed without being conceived, because the very name of John Stuart Mill is a red rag to many writers, and because it is thought that certain conservative and stagnant superstitions are always served if a reproach can be hurled at his reputation. I give myself no further trouble than to say that while there is not a word in the book of superfluous effusion,—which in reference to a somewhat frigid, unsympathetic man would have stamped even a filial tribute with at least a faint impress of insincerity,—proofs, direct and indirect, of affection, of gratitude, and of even overweening admiration are abundant, and not in a single instance is the father spoken of by the son with a freedom which amongst rational beings can be considered unbecoming.

When we come to consider the practical and intrinsic value of the education Mill received from his father, we are on more difficult ground. Some think the question is settled when they have said, It never made Mill a scholar. It would be as germane to the matter if they were to say, It never made him a soldier or a gymnast. He never desired to be a scholar, and his father never wished him to be a scholar, in the ordinary sense of that word. He had a fine taste for literary form, and became so great a master of expression that a distinguished Oxford Professor is said to have remarked that if Aristotle could have returned to the earth he would have preferred Mill's English to his own Greek.

But he had neither time nor special liking for those comparatively barren niceties with which scholarship is concerned. The extent of Mill's reading, however, was very great, and if scholarship consisted of exactly remembering books, and the minutest refinements of their meaning, he would have been amongst the first of scholars. A more scholarly education would not have added to his power; nor has a passage ever been pointed out in his writings which would have been more accurate, or more cultured in spirit, had Mill received his education at Eton and King's. From a remark to the effect that his father never taught him prosody, it is just possible to suppose that even his Latin quantities may have been uncertain; and if this were so, where is the public school man who would not be tempted to give him up altogether? But one is sustained by a sort of vague faith that no truly great Englishman could be given over to such utter reprobation.

Whether he was a scholar or not, Mill possessed almost encyclopedic knowledge; and the great virtue of his knowledge was that it was all available. This was the fruit of his father's constant testings and trials, not only of his acquirements, but of his power of using them. One so capable as Mill was of acute and prolonged analysis was not likely to lack the powers of abstract thought which many students derive from Mathematics. His natural power of pursuing error through the most intricate windings was polished to the highest degree by that profound mastery of Logic which eventually produced his great Text-book on that subject, but which was hardly more conspicuous in that work than in his other writings. Having, therefore, the advantage of reviewing Mill's education, with a knowledge of the work in the world which he was destined to accomplish, we can pronounce it, as a matter of fact, the best he could have received. In area of acquirement, in perfect appropriation of

all he learnt, and in the full development of the power of using everything he knew, Mill was as well furnished by his father's instructions as even a prodigy could be, and infinitely better furnished than a prodigy was likely to be.

The objection that Mill's education killed his human appetites is most trivial. Human appetites are no doubt essential to a manhood complete at all points, but there are so many even intellectual men who are slaves to them, that we can bear without repining the existence of one eminent man out of whom the early morning sun of philosophy drew all such humours. And even allowing that a philosopher without human passions is likely to misjudge his fellow men, the errors into which he falls from this cause are precisely those which his pupils may be trusted to correct without prompting or assistance.

In his education, as in other things, Mill was an exception, not an example or a rule. Leaving on one side the important question of religion, no better education could have been devised to give to such a man as Mill was the best material with which to work, and the best safeguard against besetting errors; for his natural temptation was not to hardness but to sentimentality, not to superciliousness but to excessive sympathy. A public school training his father could not have got for him if he had wished, and would not if he could. Nor would it have been of the slightest advantage to him. Most likely it would have lessened his capital and diminished his skill. It might have saved him from being called a prig occasionally, but it would in all probability have damped or perverted the pure aspiration for the public good which was the one guide of his life. The fire of his utilitarian zeal could only have been ignited at such a flame as burnt in his father's bosom, just as the harsh glare of the fire so kindled could only be mitigated by zephyrs of sympathy and sentiment which never blew in his father's

vicinity. Brought up at a public school, it is just possible that Mill might only have been heard of in a small circle, as a shrewd and competent official, or mentioned by the very curious as the writer of a review-article or two of uncommon originality and force.

But it would be a mistake to suppose that his experience is any guide, or that his father's conduct is of necessity a good example. The modest supposition of Mill, that he was a very ordinary boy, and that almost any lad could go through a similar education to his with like results, is too absurd to be entertained. The shortest way to express one's feeling on the subject is this : Any of us who can appreciate a really fine intellectual training must envy John Mill his tutor and his studies ; but hardly one of us would subject a child of his own, even if he promised to be clever, to so severe an ordeal. There is no occasion to scrutinise the case of John Stuart Mill as an educational example. It is simply an exception to all rules. Even James Mill did not attempt the same plan with his other children. He knew very soon the greatness of his son's capacities, and prepared him for the world in the way he thought most likely to make him useful. The example can never apply until such a son is born to such a father. Education is rather an imperfect practical art than an exact science, not because education is more subject to caprice than other things, but because the facts of each case on the side of the taught, on the side of the teacher, and in reference to surroundings, cannot be predicated. Circumstances cannot be brought together as wanted. As a practical art, education consists in sending average boys to the best accessible schools, and in raising the average results of schools to the highest possible point. There is nothing in Mill's bright particular case that need interfere with this ordinary process once in a million of instances.

Much as this account of Mill's education has been talked about, it is not half so wonderful as the succeeding passages of the *Autobiography*, which show how little his education succeeded in stifling certain natural instincts which it had sternly restrained. Mill speedily became everything he was not expected or wished to be, without losing a single valuable product of his father's teaching. Reaction may account to a certain extent for his rebound from the hard and dreary utilitarianism of his father, and of Bentham, to the sentimental, the poetical, the almost religious tone of his own philosophy. But reaction will not wholly account for it, and the stoutest opponent of innate ideas will admit that it is hard to explain how new impressions to which he was casually subjected marked him so deeply. This congenial and hitherto unquestioning pupil of James Mill became a disciple of Wordsworth. He was relieved at the height of a twelvemonth's moral crisis by a pretty passage of Marmontel. He made friends with Carlyle. Carlyle pronounced him a new mystic. He became more attached to John Sterling than he ever was to any other man. He co-operated with Bulwer, and learnt to recognise in Maurice one of the most powerful minds of the age. Surely there is something which impels the human mind to push beyond its circumstances, and to select for itself from amongst the ideas submitted to it those which most harmonise with its own texture and fabric. The old illustration of a blank sheet may indeed be preserved; but if the mind is originally a blank sheet as to actual ideas, it is congenitally tinted and saturated with tendencies, and has intellectual and moral affinities which are sure to govern more or less its formation of opinions and its development of faculties.

A single page of Mill's great Essay on Bentham suffices to illustrate the existence in him of capacities and cravings

which a mere Benthamite utilitarianism could not satisfy. He tells us that "if any of the truths which Bentham did not see had come to be seen by him, he would have remembered it every where and at all times, and would have adjusted his system to it. . . . But this system, excellent for keeping before the mind of a thinker all that he knows, does not make him know enough." Accordingly, "no one who in a highly instructed age ever attempted to give a rule to all human conduct set out with a more limited conception" than Bentham, "either of the agencies by which human conduct is, or those by which it should be, influenced." "Bentham," says Mill, "had no place in his system for honour, for love, for beauty, for the passion for power and the passion for action, for the need of a sympathising support, or of objects of admiration and reverence." He "confounded all the disinterested feelings which he found in himself with the desire of the general happiness, just as some religious writers, who loved virtue for its own sake as much perhaps as men could do, habitually confounded their love of virtue with their fear of hell." Such a system, Mill says, "can do nothing for the conduct of the individual beyond prescribing some of the more obvious dictates of worldly prudence and outward probity and beneficence." "It will do nothing," he says "(except sometimes as the instrument in the hands of a higher doctrine), for the spiritual interests of society; nor does it even suffice for the material interests. . . . Whatever can be understood, or whatever done, without reference to moral influences, his philosophy"—that is Bentham's—"is equal to; where those influences require to be taken into account, he is at fault."

I need not remind you how nobly this negative criticism branches and blossoms out in Mill's *Essay on Utilitarianism* into a positive system. It includes within its range all the moral elements, all the beautiful side of human character,

all the lofty and tender emotions he accuses Bentham of ignoring. In the opinion of many Christians — an opinion which Mill himself supports — it is not only consistent with but supports and glorifies the morality of the Gospel. We cannot but recognise in these voices of a higher life — these rays of a brighter light — than James Mill's, the rapid acquisitions of a nature attuned to all that is best and loveliest in humanity. There is nothing in John Stuart Mill's education to account for it. There is not enough in the mere play of companionships, of reading, and of new associations upon a placidly receptive mind.

There must have been in Mill's nature an attraction for these fruitful ideas. The soil must have drawn, insensibly but swiftly and surely, to itself the seed which it was best fitted to nurture. The fair scroll, already written within and without with all the abundance of a hard, material knowledge, must have unrolled itself instinctively as the pens of ready writers hovered over it, to erase the coarsenesses and sordidnesses of a narrow, unloving unphilosophy, and to inscribe, in delicate but ineffaceable characters, the lessons of love, of beauty, of charity, of veneration for all that is divine.

Such a spectacle is by no means uninteresting in a philosophical light. It has been necessary ere now to make a strong fight and to win battles against the doctrine of innate ideas. If we were to poll to-night the scientific, or even the thinking men of the age, we should find a large majority in favour of what is called the sensational philosophy, and of opinion that the intuitionist theory is utterly unscientific. Mr. Mill himself regarded this question as one of much more than abstract interest. He declares it in this book to be "full of practical consequences," and to lie "at the foundation of all the greatest differences of practical

opinion in an age of progress." He wrote one of his finest books in declared hostility to the philosophy of Sir William Hamilton, which "discourages the explanation of feelings and moral facts by circumstances and association, and prefers to treat them as ultimate elements of human nature; a philosophy which is addicted to holding up favourite doctrines as intuitive truths, and deems intuition to be the voice of Nature and of God, speaking with an authority higher than that of our reason." The fiercest academic struggle of recent times took place when Mr. Mill's disciples, with Mr. Grote at their head, succeeded in defeating Mr. Martineau as a candidate for the Chair of Philosophy at University College; and there can be no doubt that when Mr. Martineau was defeated the victory fell to those who represent the superior forces of contemporary metaphysical opinion.

Yet it cannot be denied that the whirligig of time, of which we hear so often, has brought some revenges which the Sensationalists did not dread, and which the believers in Intuition never hoped for, from the ultra-scientific and materialist quarter whence they have presented themselves. Intuition should never be a guide in morals, or a corrective of reason; nor was it in this way that Mr. Mill escaped the cold and barren errors of his early Benthamism. But I submit to you the reasonableness of the presumption, that natural tendencies of Mill's mind, long repressed, but not permanently repressible, rendered him in his adolescence healthily open to truths which his education had hidden. Reason is the only judge, and a large utility the ultimate test; but such apparently innate tendencies as Mill's towards previously unaccepted aspects of truth must be gratefully acknowledged as valuable elements in the mental progress of mankind. And I claim for this view the support which it must derive from the Darwinian influence, which has lately so potently operated on every department of human

enquiry. The lineal transmission of habits, the effects of race, the descent and revival after intermissions of hereditary peculiarities, and the sympathy and almost solidarity of mind and body, are now understood as they never were before. And what is the result in metaphysical enquiries? The result is this: that if on the one hand scientific authorities tell us, with a new approach to unanimity, that innate ideas have no existence, they also largely concur on the other hand in a doctrine of evolution which involves, as Dr. Carpenter assumed in his Roscoe lecture, a congenital inclination towards certain beliefs.

Perhaps it would hardly be pressing this argument too far to say, as was suggested by a thoughtful friend of my own, in a conversation immediately after the death of Mr. Mill, that the transmission of hereditary qualities may afford a scientific explanation of the seemingly genuine independence of all religious influences by which a few eminently good as well as eminently scientific men are characterised. Although themselves free thinkers, they come in most instances of progenitors who, as far as they can be traced back, have been professors of very earnest religion. It may be fair matter of speculation, whether the moral qualities so transmitted may not be the secret of a natural and practical, though inarticulate piety, which neither has the dogmatic basis nor needs the devotional sustenance of religion as generally found amongst men.

But it is not matter of speculation at all, but matter of certainty, that any hereditary tendency which brings out unlooked for facets of truth must be beneficial. Many of the evils attending the theory of Intuition are mere abuses of it, just as many of the horrible ideas attributed to Christianity by James Mill and others have no logical connection with its mild and beneficent doctrines; and so long as the believers

in Intuition are willing in practice to submit their innate ideas to the tests of experience and utility, no harm can come of them. The practical value of Mr. Mill's disquisitions on this subject, therefore, is not so great as he supposed, though their scientific beauty and importance cannot be exaggerated.

The practical lesson of the second period of his autobiography—namely, the utility of moral sensibility as an intuitive aid to the perception of the whole truth in Ethics—remains perfectly established, especially under the light thrown by the Darwinian theory on the structure of the mind, whichever side of the great old metaphysical dispute between the sensations and the intuitions retains the final advantage.

This was only one aspect of the growth of Mill's character. The experiences which ministered to its expansion and strength were various, and of very different importance. I pass over, as comparatively trivial to us, though serious enough to him, the crisis of low spirits which almost overwhelmed him, and which, like most other crises of depression, passed away almost as causelessly as it came. Few will read his account of it without a feeling that it coincides with incidents in their own experience; but after all, its chief instruction to us is in the fact of so great a man having so commonplace and childish a mental conflict. The relief Mill obtained at last by perceiving that happiness would best be secured by doing one's duty, and not making felicity a special aim, reminds us that very obvious truths are often of special efficacy in special moods, though at other times they would appear trite. Any Sunday school child could have told Mill that the best way to be happy was not to think about it, but to do right; yet we can understand the truth coming with great freshness to a sentimentally puzzled

young Utilitarian, and remaining with him through life as a consolatory and not to be forgotten lesson. Half the changes and conversions that occur in the history of men's minds are produced by means quite as simple. It was, however, by more subtle intellectual processes that the man as he was in his prime was formed.

Companionship did much. We are accustomed to regard John Stuart Mill as one who, having been educated alone by his father, spent the rest of his days at the India House and in his study, seeing no one, and never having known the men of his day. The *Autobiography* entirely upsets any such idea. Besides Hume and Bentham and Ricardo, men of the preceding generation, he was acquainted with a great number of those who have since set their mark upon this age. With many of them he spent much time in intellectual contests, which must have placed him in possession of all that was in their minds, while they called upon him in return for all the force of intellect he could bring to bear in order to make up his own. A young man who could at once admire Bentham and Carlyle, the Austins and Frederick Maurice, James Mill and Coleridge, could not but acquire a rich variety and a rare candour of mind. Bowring, Molesworth, Buller and Grote were all amongst his friends, besides those I have named in a former passage. While it is known that he fully held his own in debate, and maintained on the whole the tenor of his early principles, it is also undeniable that, in the united studies and hot discussions of these young men, all fermenting with the excitement of new social and political ideas, he gathered into the storehouse of his own mind, and saved for good use in the future, many conceptions and appreciations which were invaluable in the more methodical philosophy of his later years.

Nothing can be more unexpected or more shrewd than the judgments he passed at that period. James Mill's son—

a manufactured Utilitarian thinking machine, as some fancy him to have been — was the last man who should have loved Wordsworth; but he confesses how infinitely he was indebted to the poet, adding, however, with a characteristic exact apportionment of eulogy: “Compared with the greatest poets, he may be said to be the poet of unpoetical natures. But unpoetical natures are precisely those which require poetic cultivation. This cultivation Wordsworth is much more fitted to give than poets who are intrinsically far more poets than he.” There is not, in all criticism, a keener or more beautiful dissection than this, and nothing could have been less expected from a young man trained as John Mill was trained. “The speaker with whom I was most struck,” says he, “though I dissented from nearly every word he said, was Thirlwall the historian, since Bishop of St. David’s, then a Chancery barrister, unknown except by a high reputation for eloquence acquired at the Cambridge Union. Before he had uttered ten sentences, I set him down as the best speaker I had ever heard, and I have never yet heard any one whom I placed above him.” Here is another judgment which those who have heard the Bishop, even in his later days, will see to be indicative of candour and sound critical faculty. A still more suggestive passage is his sketch of Roebuck. What a new, and almost humorous light it throws on the characters of these two remarkable men to hear that, after being great companions, a schism arose and widened between them, because Roebuck was unable to assign the feelings their due share in the Utilitarian system. Roebuck loved Byron, whose writings were in his opinion the poetry of human life; Wordsworth’s he called the poetry of flowers and butterflies. “Personally,” says Mill, “instead of being, as Benthamites are supposed to be, void of feeling, Roebuck had very quick and strong sensibilities. But, like most Englishmen who have feelings, he

found his feelings stand very much in his way. He was much more susceptible to the painful sympathies than to the pleasurable, and, looking for his happiness elsewhere, he wished that his feelings should be deadened rather than quickened. And, in truth, the English character and English social circumstances make it so seldom possible to derive happiness from the exercise of sympathies, that it is not wonderful if they count for little in an Englishman's scheme of life. In most other countries, the paramount importance of the sympathies, as a constituent of individual happiness, is an axiom taken for granted rather than needing any formal statement; but most English thinkers almost seem to regard them as necessary evils, required for keeping men's actions benevolent and compassionate. Roebuck was, or appeared to be, this kind of Englishman. He saw little good in any cultivation of the feelings, and none at all in cultivating them through the imagination, which he thought was only cultivating illusions."

In all such observations on those around him, and on the ideas by which they were influenced, we see the rapidly enlarging mind and mellowing character which were soon to develop and ripen into the most perfect example of perceptive, appreciative, and sympathetic intelligence the world has ever seen; and I prefer to dwell on the passages which illustrate the formation, rather than on those which chronicle the employment, of his powers, because the great lesson to be learnt from this autobiography is not how a man may write great books, but how he may wean himself from prejudice, and expand his sympathies to the utmost reach of human apprehension, without escaping from the control of strict reason.

Here is another extract, which bears indirectly on a point

raised in the sketch of Mr. Roebuck, and which to those who have caught the keynote of Mill's character is full of balanced harmony. He is speaking of a much prized episode in his education, his stay for a whole year at Montpellier, "in the free and genial atmosphere of continental life. This advantage," says he, "was not the less real, though I could not then estimate nor even consciously feel it. Having so little experience of English life, and the few people I knew being mostly such as had public objects of a large and personally disinterested kind at heart, I was ignorant of the low moral tone of what in England is called Society; the habit of not indeed professing, but taking for granted in every mode of implication, that conduct is of course always directed towards low and petty objects, the absence of high feelings which manifests itself by sneering depreciation of all demonstrations of them, and by general abstinence, except among a few of the stricter religionists, from professing any high principles of action at all, except in those preordained cases in which such profession is put on as part of the costume and formalities of the occasion. I could not then know or estimate the difference between this manner of existence and that of a people like the French, whose faults, if equally real, are at all events different; among whom sentiments which by comparison at least may be called elevated are the current coin of human intercourse, both in books and in private life, and though often evaporating in profession are yet kept alive in the nation at large by constant exercise, and stimulated by sympathy so as to form a living and active part of the existence of great numbers of persons, and to be recognised and understood by all. Neither could I then appreciate the general culture of the understanding which results from the habitual exercise of the feelings, and is thus carried down into the most uneducated classes of several countries on the Continent in a degree not equalled in

England amongst the so-called educated, except where an unusual tenderness of conscience leads to habitual exercise of the intellect on questions of right and wrong. I did not know the way in which among the ordinary English the absence of interest in things of an unselfish kind, except occasionally in a special thing here and there, and the habit of not speaking to others, nor much even to themselves, of things in which they do feel an interest, causes both their feelings and their intellectual faculties to remain undeveloped, or to develop themselves only in some single and very limited direction, reducing them, considered as spiritual beings, to a kind of negative existence. All these things I did not perceive till long afterwards; but I even then felt, though without stating it clearly to myself, the contrast between the frank sociability and amiability of French personal intercourse and the English mode of existence, in which everybody acts as if every body else, with few or no exceptions, was either an enemy or a bore."

This is not a pleasant passage for English people to read, and it is open at many points to sharp, though not I think to fatal criticism. Amongst other things, it may be said that it is inconsistent with Mill's dictum in this book, that it is ridiculous for highly cultivated people to waste their time in social intercourse. Remember, however, that he is speaking of such arid and insincere social intercourse as he in the passage just read asserts to be the fashion of this country. It was most likely his absolute inability to join in, and his almost absolute inability to tolerate, the soulless and conscienceless — too often the mindless — talk of Society that gave him so strong a taste for seclusion. He could not make a mock of sin, either moral or intellectual, as worldlings always do, and as many who are not worldlings do whenever they are in worldlings' society. If he had not been so conspicuously simple — so transparently sincere — he would, in

spite of his eminence, have been voted a prig and a Peck-sniff. But it mattered not to him what he was called. He would say what he felt, even if what he felt was high in tone; and he could with difficulty conceal his disgust when others whom he believed to be as capable of pure and virtuous emotion as himself indulged in the cynical slang which is the conversational circulating medium of Society in this Christian land.

It is only in this desultory way that I can suggest the impressions produced by the *Autobiography* at this middle, though early, period of Mill's life; but enough has, I hope, been said to show what he was, and how he shaped for that subsequent career which is part of his country's mental and political history. His intellectual impulses were noble. His prejudices were few, and well subordinated. He saw light in the most unlikely places. He welcomed it eagerly whether it came in a slender beam which other men as strongly educated would have despised, or in a dazzling glare from which others would have turned away their gaze. To him no thought was unsympathetic. Even the Christianity which he could not accept received from his pen such fairness and appreciation that every form of it wears a brighter aspect in his books than in the writings of Christian polemics. Mill hardly ever attacked an error without stating all that could be said for it much more plausibly than its author.

How he acquired this noble spirit, not even this *Autobiography* can tell us. But it exhibits to us its most juvenile manifestations, and shows us how early Mill discovered that candour is the best clue to truth; that ingenuousness is the best spur to ingenuity; and that in the favourable apprehension of all that is reasonable in erroneous systems we learn a shorter way into the right path than can possibly be found

amidst the dust and throng and noise of unthoughtful partisanship. These lessons, taught by so bright an example, in whom candour was not aimless charity, nor toleration of error the foible of a puny or errant judgment, nor suspension of thought a cover for ignorance, are of such inestimable value that the name of Mill would have shone brightly amongst the benefactors of his age and nation if no academic *imprimatur* had acknowledged his books as standards, and if no wreaths of public fame had been decreed him for substantial original discoveries.

What he became in after years he promised to be as soon as his education by his father, and his education by debate with young men of his own age, was completed; but he was at that point on the eve of an occurrence which greatly accelerated his progress. He was now ripe for the one blessing that was needful to complete the exceptional felicity of his lot. Happy in his unexampled education, and in his unprecedented aptitude for profiting by diverse friendships and acquaintanceships; happy also in a daily official occupation, "sufficiently intellectual not to be a distasteful drudgery, without being such as to cause any strain upon the mental powers of a person used to abstract thought or to the labour of literary composition," he now needed, or at least we can say so in our wisdom after the fact, a co-operative and sympathetic companion. And he found that helper in a woman. If ever a man had a helpmate or a help-meet, it was Mill, in Mrs. Taylor, who eventually became his wife. What he would have been without her cannot be properly guessed, but the *Autobiography* demonstrates how greatly she contributed to the formation of his character and the improvement of his books. It is no doubt unlikely that a thinker who had already shown so marvellous a faculty for seeing all round questions, and for appreciating the human side of

topics formerly discussed in a manner so partial and so hard as to be at once pedantic and unphilosophical, would have altogether fallen short of his subsequent great achievements if he had gone on working by himself. Nevertheless, I for one accept, with few qualifications, the view of Mrs. Taylor's character and serviceableness which is presented to us in this record of the life of which she made so great a part.

It is characteristic of the sort of people who have girded and kicked at Mill since his death, that they find no portion of his memoir so weak and laughable as his eloquent and affecting account of this lady. Some of them dare to lift their heels against her character, and the purity of the intimate friendship which subsisted between her and Mill for many years before the death of her husband. To these I have little to say. A Literary and Philosophical Society can be useful in many ways, but it would wander into alien and misleading functions if it assumed to be a censor of propriety. Two words are enough on the subject. The husband of Mrs. Taylor, against whose honour and intelligence as a high-minded gentleman no one has uttered a word, was cognisant of and countenanced Mill's friendship with his wife from first to last. That is the first word. The second is, that the imputations cast upon Mill and her are not believed in by half a dozen sane and clean-minded people. Those who hurl the prurient slander are the very men who complain that Mill's father by an unnatural system of education banished finally from his constitution all masculine passion. They have since his death been so severely belaboured by gallant friends of the departed great man, that they must have been provoked into substantiating their insinuations if they had been able to do so; but they are silent. Never was a foul charge made so faintly, under circumstances so favourable to calumny.

Faltering in their accusations, these writers sustain their spirits by making merry with Mill's belief in his wife's intellectual greatness. They ridicule it as an hallucination. They declare that no one ever had proof that the lady possessed any intellect at all; that no one remembers a thing she ever said. They think it enough to quote as essentially and necessarily imaginative Mill's descriptions of her mind and her work. They are especially merry over a passage in which, after a most generous and over-wrought tribute to Carlyle, Mill says that he never presumed to judge Carlyle with any definiteness until he was "interpreted to him by one greatly superior to them both — more a poet than he, and more a thinker than Carlyle — whose own mind and nature included his and infinitely more." This may be hyperbolical, though it is quite possible to conceive it to be almost literally true; but, in any case, a woman of whom such a man as Mill could deliberately write such words can be no subject for the flippancies of which certain *nil admirari* ribalds of society have made her the subject, at the moment when her memory should have been most gently regarded. In his *Subjection of Women*, Mill observes that hardly any man understands any woman except one—his wife. The comic critics of the *Autobiography* go farther, and say that Mill did not even understand that one. If he failed, it was not for want of study, and it could not have been for lack of general insight. They say he failed because he studied her under the inspiration of love; and as no polite or intelligent person will ever plead guilty to sentiment, this is accepted by many, even of those who believe in Mill, as a conclusive knock-down argument. Because this philosopher loved his wife rapturously, and yet neither quarrelled with her nor was jealous of her, nor thought her a pleasant fool, nor treated her as a toy, but knew and acknowledged his obligations to her, all men and women of the world are

to consider her a ridiculously over-rated person. Let us get out of this atmosphere. The crackling of thorns under a pot may be very pretty music in a club smoking-room, but it should stay there.

There is no denying that Mill was affectionately attached to his wife for twenty-seven years, and that after her death he cherished her memory with a profound devotion not at all distinguishable, except by the addition of a gentle melancholy, from the feeling he had cherished towards her in life. Writing when she had been dead three years, he said, "Since then I have sought for such alleviation as my state admitted of by the mode of life which most enabled me to feel her still near me. I bought a cottage as close as possible to the place where she is buried, and there her daughter (my fellow sufferer and now my chief comfort) and I live constantly during a great portion of the year. My objects in life are solely those which were hers; my pursuits and occupations those in which she shared or sympathised, and which are indissolubly associated with her. Her memory is to me a religion, and her approbation the standard by which—summing up as it does all worthiness—I endeavour to regulate my life." I know of no reason, except the grossness and vulgarity of this age, why a passion such as this should be thought less noble and historical than many more frivolous loves which have been enshrined in our poetry and literature. I cannot understand the mind which can think tenderly of Byron and his Countess Guiccioli, fruitful only in bad and sensual example, and find food for mirth in the love of Mill and his wife, which purports to have been so fertile in advantages to the world, and which at the very lowest must have ministered soothingly in mere peace and consolation and support to a great mind engaged in great works. But I do admit that a devotion so ardent may have tended towards idolatry, and even have led Mill into flights

of hyperbole. What it concerns me to insist upon, therefore, is the internal evidence that, making all due allowances for a lover's ardour, Mrs. Mill stands established in literary history by this book as her husband's able and effectual coadjutor, and the accelerator, if not the inspirer, of some of his most valuable innovations.

No doubt it is startling to be told of any woman that Shelley was but a child to her in thought and intellect; but in forming a judgment we must remember how keen a critic Mill was, and how circumstantial is his account of his wife. He had ample time both before and after marriage to become disillusionised. During that period he did a great deal of good work, in which he positively testifies he had his wife's assistance; and instead of his narrative of her share in his labours being a mere general or wholesale laudation, it carefully discriminates at every point the amount of her collaboration. He asserts that she was recognised by an outer circle as a beauty and a wit, and by an inner circle as a woman of penetrating intelligence, and of an eminently poetic and meditative nature, when he first made her acquaintance. She was already the centre of a circle of sympathetic friends when he was admitted to her society, and found "she possessed in combination the qualities which in all other persons he had known he had only been too happy to find singly." Her mind, he says, was a perfect instrument, alike in the higher regions of speculation and in the smaller practical concerns of daily life, piercing to the heart and marrow of the matter, and seizing the essential idea or principle. Her intellectual gifts ministered to a moral character at once the noblest and best balanced he had ever met with, and her unselfishness was "not that of a taught system of duties, but of a heart which thoroughly identified itself with the feelings of others, and often" — this is a fine touch — "went to excess in consideration for them by imagi-

natively investing their feelings with the intensity of its own."

Many years passed before the intellectual companionship of Mill with Mrs. Taylor was complete, and no doubt she benefited and improved not a little by the friendship of a man to know whom was a constant mental exhilaration and moral tonic ; but the stamp of truth is unmistakable on the account he gives of the precise influence she had upon his mind. His own strength, of which Mill, modest as he was, was perfectly conscious, lay in what he calls the uncertain and slippery region of theory in moral or political science. Hers was in the two extreme regions of thought which lie on either side of this theoretic territory. On the one hand, her intellect shone in the conception of "ultimate aims — the constituent elements of the highest realisable ideal of human life." On the other hand, its instinct was keen and true in the region of the immediately useful and practically attainable. These distinctions are idle sounds to those who have not appreciated the essential differences between Mill's writings and those of other and perhaps more striking philosophers. To his judicious and critical admirers, there is in them not only probability but new light. In proportion as we have estimated the special value of Mill's tone, shall we perceive the significance of his confession that, in reference to his conclusions in political and moral philosophy, not the least of his obligations to his wife was a wise scepticism, which, while it did not hinder him from following out his reasonings to their conclusions, put him on his guard against holding or announcing those conclusions with undue confidence, and kept his mind not only open but eager to seek clearer perceptions and better evidence. "I have often," says he, "received praise which in my own right I only partially deserved, for the greater practicality which is supposed to be found in my writings, compared with those of

most thinkers who have been equally addicted to large generalisations. The writings in which this quality has been observed were not the work of one mind, but of the fusion of two, one of them as pre-eminently practical in its judgments and perceptions of things present, as it was high and bold in its anticipations for a remote futurity."

If this is mere love-ecstasy, there is surely method in its madness. It is the most analytical love-rapture that ever came to light in this work-a-day world. The credulity of cynical scepticism, which is always vast, can surely go no farther than to reject an account of the origin of certain philosophical qualities in books, the laborious and concerted preparation of which was distinctly in the recollection of the narrator, when that account is in itself, if not highly probable, perfectly consistent with the characters of the personages concerned, and entirely in accord with the best and most natural conceptions we can form of a perfect co-operation of the intellectual gifts of the sexes. I feel bound, however, in candour to say, that while few sympathise with the odious and unmanly tone in which doubt has been cast on Mrs. Mill's share in her husband's growth and achievements, there is a very general belief, amongst those who are most entitled to strong opinions, that the philosopher's record of her intellectual services to him is somewhat hyperbolic. This is easy to understand. Even the sharp analysis of Mill's critical statement of those services cannot perform the surgical operation which is necessary to get into the male brain the conviction that anything great can have been done by a retiring and secluded woman. The fact that an essay by Mrs. Mill herself, written in 1851, is published, and is a really effective and epigrammatic piece of social reasoning, goes for nothing. When you have once persuaded yourself to believe that Mill was idiot enough to mistake a useless and unsuggestive woman for a genius, it is easy to

suppose that *he* wrote what he attributed to *her*, and ever afterwards laboured under the delusion that she had independently produced it.

Another great woman of the present day—one of the greatest women of all time, George Eliot—has laboured under similar depreciation, and we have all admired the subtle thrust she makes at her detractors on one of the last pages of *Middlemarch*. When Fred Vincy wrote on Turnips and Mangel Wurzel, most persons in Middlemarch were inclined to believe that the merit of Fred's authorship was due to his wife. But when Mary wrote a little book for her boys, called *Stories of Great Men taken from Plutarch*, every one in the town gave the credit to Fred, "observing that he had been to the University 'where the ancients were studied,' and might have been a clergyman if he had chosen. In this way," says George Eliot, "it was made clear that Middlemarch had never been deceived, and that there was no need to praise anybody for writing a book, since it was always done by somebody else."

I am not sanguine in the hope that, even in this literary and I might almost say classic atmosphere, I shall carry the ladies with me in the view which I have endeavoured to enforce, for they are generally, and under the present circumstances of society naturally, the hottest enemies of those who seek to assert their claim to full intellectual partnership with men. Moreover, this is a question of evidence, not of feeling, and is concluded to my satisfaction, not by probabilities, but by such testimony on the part of John Stuart Mill as must have been at once accepted on any other subject, and cannot be invalidated on this. But I cannot help pointing out that those who discredit Mrs. Mill's claims make a great mistake if they suppose that by doing so they check what they call strong-mindedness, or rebuke the error that male and female intellects are alike. Mrs. Mill did not

rush into public life. She contented herself with helping her husband. And she helped him by qualities of intellect which may be called, and perhaps may be philosophically called, feminine. But if a literary man's wife is to be denied even biographical honours, unless she is either a drudge or a trifler or a mere managing-woman in society, we must expect that all helpfulness on the part of clever wives towards clever husbands will be discouraged; and we must not be surprised if women of powerful intellect aim at that public prominence on their own account which to most people is so distasteful.

What George Eliot says of Dorothea may be true of Mrs. Mill. Some who knew her may have "thought it a pity that so substantive and rare a creature should have been absorbed into the life of another." The pious care of her husband has done its utmost, however, to secure her a place in the gratitude of mankind. If he has failed; if the engrained prejudice of the world rejects his testimony; if his "almost infallible counsellor" is denied the honour he has lavishly paid her, let us write upon her memorial tablet the words with which Dorothea is enshrined: "The growing good of the world is partly dependent on unhistoric acts; and that things are not so bad with me and you as they might have been is half owing to the number who lived faithfully a hidden life, and rest in unvisited tombs."

The suggestions of this book are so pregnant — its mere matter of fact records of philosophical progress are so suggestive — that it is necessary to place an arbitrary limit on a criticism which must be measured by your time if it has not exhausted your patience. I shall avoid, therefore, any pursuit of the fruitful topic of the remarks just concluded into the interesting region which Mill has illuminated by a careful account of the collaboration by which some of his

works were produced. Only one word as to his *Political Economy*. It has been for many years a text-book, and will every year be more and more seen to be as far in advance of previous standards as Adam Smith and even Turgot were beyond the times in which they wrote. All science is valuable, even if practical corollaries are not immediately deducible from it; but except in the one particular of free-trade (unless we add the disputed question of small farming) political economy up to the time of Mill had done so little for mankind, and had been so blind or at least so one-eyed a guide, that the abuse showered upon it by those whose moral sense revolted from the tone of its apostles was not inexcusable. Even now the better and more rational spirit of Mill is only gradually prevailing, and remains to be spread by his worthy disciples — such men as Cairnes and Thornton. As taught by McCulloch, Political Economy is absurd. As used in Parliament and to deputations by Mr. Lowe, it is atrocious. Mill's book had a general tone—and in saying so his *Autobiography* only echoes the feeling of thousands of students — that “distinguished it from all previous expositions of political economy which had any pretensions to be scientific.” It made the proper distinctions “between the laws of the production of wealth, which are real laws of nature, dependent on the properties of objects, and the modes of its distribution, which are subject to certain conditions dependent on human will.”

Those who regard Mill as merely standing on the shoulders of Adam Smith — a depreciative formula which may be applied to almost every discoverer since time began — will do well to reflect on the scientific importance of banishing the confusion which political economists had created by supposing the human will powerless to defeat or modify any “economic law” which they were pleased to agree upon. Of all the considerations of political economy this is the most

vital, because if the conditions which purport to govern the division of profits between labourers, capitalists and landlords are not final, nothing but social evil can result from treating them as if they were so. Mill attributes the incalculable improvements which this principle introduced into his Political Economy mainly to his wife's influence. He gives an account of the matter which in future ages, if not in this, will associate her name with speculations of which the progress of the world will rapidly increase the importance, especially in relation to two subjects, the land, and the future of the operative classes. Mr. Thornton has already safely carried the vital principle of Mill's book even farther than he expected it to go. The last stronghold of the old pedantic system to be overthrown was the supposed fixity of the wage-fund, and the last act of Mr. Mill as a political economist was gracefully to acknowledge that his friend Thornton had exploded this delusion for ever. If the world owes anything to Mill's wife, depend upon it the debt is a large one.

The progress of the logic, the conception of the book on Sir William Hamilton's philosophy, and many other passages of the book are very interesting, but as I should only recapitulate their points, I refrain from dwelling upon them.

Of Mr. Mill's Parliamentary career I could speak at length, with much pleasure to myself, because I saw him every day in the House of Commons, and heard every speech he made. So far as the *Autobiography* is concerned, however, this brief portion of the philosopher's life does not call for much comment. Mr. Mill justifies from the stand-point of his political philosophy, and from the stand-point of his personal duty as a Member of Parliament differing in important respects from others, his conduct on most of the ques-

tions on which he spoke and voted. He claims credit for having pioneered Mr. Gladstone's Land Bill, not only (as we all know he did) by the advanced land principles of his *Political Economy*, but by a pamphlet proposing purposely a course much more radical than could possibly be pursued. He tells us how he came to be the trusted champion of the working men whom, to their face, he had declared to be, and during his canvass again pronounced, specially prone to lying; and he justifies, by considerations very binding on his conscience, certain acts of his which brought much odium upon him, though no one could doubt that their imprudence, if they were imprudent, sprang from ardent public spirit.

He does not tell us, for it was not likely to occur to him, what was the principal value of his Parliamentary life. Any conclusion drawn from it must be qualified by the uniqueness of his character; but his is not the only case—Mr. Fawcett's is eminently another—in which the old English political prejudice against philosophers has been signally discredited. This prejudice has by no means been confined to Conservatives. It was expressed only a fortnight ago by Sir Wm. Harcourt, in a speech every valuable word of which was derived from the philosophers whom he insulted; and very shortly before Mr. Mill's entrance into Parliament one of the greatest English Radicals of any age gave vent to it in the epigrammatic observation, that he wouldn't object to "thinkers" if they didn't always "think wrong." That eminent man learnt to believe before many months were over his head that Mr. Mill, *par excellence* a thinker, almost always thought right—for the best of all reasons: Mr. Mill and he almost always voted in the same lobby.

Mr. Mill arrived at his political resolves after a more troubled and exhaustive examination. To the last he must have retained that aversion to "rule of thumb" statesmanship which he expressed in his essay on Coleridge. But he

came by argument to conclusions which men who are called practical statesmen arrive at — after being unconsciously helped by the philosophers — by instinct; and he was as enthusiastic in urging forward what he believed to be necessary, on a balance of considerations after seeing all sides of a question, as others were who had seen only one side all the time. This was the utility of his Parliamentary life. So long as philosophy is cold, and treats even its final political conclusions as still matters of doubt, it can neither animate nor correct the statesmanship of ministers or tribunes in a popularly governed state. When it enforces a political policy with energy and even heat, however slightly the scale of candid argument may have turned in its favour, philosophy becomes the check and the impetus it ought to be in public affairs, and mere empiricism or adventure has a criticism to face which may fatally damage it even in popular esteem.

As a Member of Parliament, Mr. Mill was most patient and regular in his attendance. He and old Mr. Henley used to face each other for hours when the discussions were too dull for any one else steadily to listen to them, and like Mr. Henley he was too much interested in his fellow men to find it necessary to relieve his attention by even an occasional indulgence in reading or writing. The effect of his speaking, which was almost always evidently by rote, was good. At first it was interfered with by the weakness of Mr. Mill's appearance and delivery. Was this weak, almost voiceless, elderly gentleman the great philosopher of whom everybody had been so frightened? Every squire and manufacturer in the House took courage, and a fashion set in of laughing, good-naturedly or bad-naturedly, at Mr. Mill as a sort of funny old amiable eccentric. He was not the first great man whose personal aspect has disappointed those whom his writings had deeply impressed. St. Paul's place in history and literature was not finally fixed by those who pronounced

him in speech contemptible; and in the House of Commons Mill had what is without exception the fairest and finest audience in the world. It loves every sort of good speaking for its own sake. It will listen even to bad speaking, if there is anything in it. It yields to the fascination of literary and logical form, even when every other oratorical charm is absent.

After a trivial effort or two, Mr. Mill made several set speeches, which the House rapidly crowded to hear, and which were intensely and generally admired. On his first entrance he had been greeted by Mr. Lowe—whose boyish or Colonial rudeness is a marked blemish of a striking character—with the exclamation, “The honourable member for Westminster is a great deal too clever for us in this House.” But Mill was not to be set down by any such impertinences, however well they might take with the House. Mr. Lowe had to meet Mill’s arguments, and failed in answering them. He has since been a prominent member of a Government which, whether right or wrong, has legislated mainly in Mill’s spirit, and largely under Mill’s inspiration.

I am sure it will have been gathered from the tone of this Paper that I have no sympathy with those who call this a sad book. I cannot bring sadness and this autobiography any how on to the same level. Here is a man, enviably brought up, and instructed on a system which vastly enlarged and fully stored the capacity, while sustaining the full vigour of his mind. His childhood, he tells us, was not rendered in the least degree unhappy by the stress of this education, or by any other cause. He enjoyed himself as much as any other lad, only in a much better way. His sympathies were retained in all their freshness, and if he ever went wrong through life it was in sympathising too much with men, not in not sympathising with them enough. He had for friends in early life the finest young men of his day, and

enjoyed a modest but keen and ecstatic pleasure in making his own all that was sound in their views, and rejecting respectfully but decidedly all that was wrong. At the India House he found an honourable, an intellectual, an important but not an exhausting daily occupation. In perfect contentment he enjoyed for twenty years the friendship of the most admirable woman he had ever known, and at the end of that period married her, and lived for seven years in such conjugal felicity as will probably be the envy of almost every philosopher that shall come after him. It is true that he lost his idolised wife prematurely, but the reviewers are not thinking of that when they call it a sad book; and he was so comforted and helped after her death by a daughter well worthy of such a mother, that he exclaims, in the joy of his still happy life, "Surely no one ever before was so fortunate as after such a loss as mine to draw another prize in the lottery of life." Successful as he could hardly have expected to be, and entirely in the way most acceptable to himself, in his Parliamentary career, he retired from it under circumstances of honour, to a life which he greatly preferred. He died in the presence of his chief comforter with an undisturbed mind, conscious of a long life of such various and complete integrity and benevolence as few of us can even conceive; saved by an invincible modesty from vainglorious self-delusion, and knowing that he would be placed where most he wished to lie, by her side to remember whom was for him to be supremely happy. If there is sadness in such a life and death, I cannot find it. I could desire, if it were any use, that we might all live and die as sadly.

No doubt there is a difficulty in many minds as to Mill's religion, or want of religion, which may account for some of the exclamations about the book's peculiar sadness; and there are few of us who do not regret that he lived without

perceiving the beauty and necessity of those Christian doctrines in which we find a solace of which he seemed independent, and a support under temptation which his most intimate friends could not discover that he required. But, while feeling this as deeply as others, I will take my chance with Principal Caird, and assert the heresy that it is not for us to judge the final state of unbelievers in whom there is no lack of reverence or enquiry, and no indulgence of free-living beneath the cloak of free-thinking.

My deepest regrets as to Mill's attitude towards religion arise, not from the sadness of his state, but from a feeling which it is impossible to express fully here, that his philosophy was seriously spoilt on its practical side by a belief or an assumption of the rapid perfectibility of mankind, which there is nothing whatever in experience to justify. What may come hereafter we know not, but as yet one age has been very like another; and religion, if not the only, has been from age to age the principal corrector and sweetener of human life. By such moral evidence it best commands assent, and it is a pity such evidence did not convince the greatest practical philosopher of our day. Mill deserves praise for his bold criticism of the argument from design, and for his yet bolder rejection of that favourite stronghold of sentimental Deism, a supposed—but hardly supposable—perfection in the order of Nature. Where he failed was in not recognising the importance of religion as a good and indispensable influence on men and their affairs. He was free from the outrageous malignity of his father towards Christianity, and indeed did it and even its sects great justice; but he thought the world could do without it, and this, if not a sad faith in any other sense, was sadly unphilosophical.

Let us, who have learnt at our mothers' knees truths which so instilled could not but seem fraught with tenderness, cherish a kindly consideration for one who first heard

of Christianity from a hard-headed father who thought it demoniacal. And, while acknowledging that as a system of public and private morals Mill's Utilitarianism is perfect, let us rejoice that the simplest man, woman, or child has only to be a Christian in order to fulfil it.

My task, so far as I can perform it, is done. I know how much the dignity of an almost perfect character must have suffered under so rough and cursory a discussion. But I hope I have been able to shadow forth vaguely at least its noble outlines. Mill's *Autobiography* is a matchless monument. No character was ever so fit to be commemorated by a simple recital of the influences that had formed it, for the interest and usefulness of Mill's teachings were more personal than in the case of any other philosopher. Perhaps his gift is incommunicable. "Secrets" are easily handed down, but "methods" are learnt with difficulty, amidst constant tendencies towards the errors which they avoid. Mill made discoveries, and these will be preserved. He enlarged the borders of science, and his annexations are immortal. But his best legacy is the lesson of his life—the lesson of thinking fairly, and thinking wisely, at all risks of inconsistency, and without reference to the fortunes of schools. To convey to those who come after us the great revelation of Mill's example, we must learn his candour; we must imitate his openness of mind; we must share his grand enthusiasm for ultimate ends; we must aim at his reasonable satisfaction with, and hearty enthusiasm for, what is intermediately practicable; his absolute superiority to prejudice; his utter indifference to the limits of schemes and theories. We must appreciate, if we cannot emulate, his incomparable ingenuity in dovetailing into what was right in the main that which was necessary to make it absolutely true. In a word, we must aspire to that serenity of thought and knowledge which melts the clang of systems into the harmony of truth.

ON SOME FALLACIES ABOUT THE INCAS OF PERU.

By THOMAS J. HUTCHINSON, F.R.G.S., F.R.S.L., M.A.I.

THE primary obstacles to a *bonâ fide* investigation on the real history of the Incas of Peru arise from the fact of so many stories, and all of them mythological, told about their origin. No doubt many of my hearers have participated in the belief of my own early reading, with reference to the past grandeur and glory of Peru being attributable to the omniscience of these lords of the soil. For we are told by the illustrious North American, Prescott, the historian of Mexico and Peru, the most brilliant accounts of Inca rule in ancient times. But in spite of the history of the Conquest being one of the most attractive, because beautifully written, of works, my faith in it must now be discarded, when I know that not only was Prescott never in South America, but that his materials were collected from the manuscripts and published works of the Spanish writers, which are deposited in the National Library at Madrid. That these were most untrustworthy is one necessity of the present Paper to demonstrate.

Prescott tells us that the Empire of Peru, at the period of Spanish invasion, and when no doubt the Inca dynasty was in full blow, stretched along the Pacific coast, from the second degree of north latitude to the thirty-seventh degree of south latitude. Its breadth he could not positively state, but he mentions it was set down as a hundred and twenty leagues average, according to Garcillaso de la Vega, "whose

geography," he adds, "cannot bear criticism." With Mr. Markham's map of the Inca territory in Peru* is a statement by Mr. Trelawny Saunders, which goes far beyond Garcillaso or Mr. Prescott, and, so far as I can see, without any foundation whatever. He says: "Beyond the present Republic of Peru, the Empire of the Yncas extended on the south into Bolivia, Chili, and the Argentine Republic [this last-named is west, I may observe, not south], and on the north it included Quito, now Ecuador." I do not believe we have any proof, or even tradition, of the Ynca territory coming to the plains of Buenos Ayres,—nor in scarcely any perceptible degree to Chili, or the westward of Lake Titicaca. This, however, is the usual grandiloquent style of writing in connection with South America. Only a few months back we have an illustration of it,† where a distinguished United States traveller, Professor Orton, tells us he "found the upper Amazon (Maranon), has been grossly misrepresented in all the more recent maps of Peru."

Polo de Ondegardo, the earliest chronicler, as well as a learned and discerning lawyer and statesman, A.D. 1550, says:‡ "The first story that these Incas put forward, though it was not the title which they finally asserted [so that there was some doubt about the original programme], was an idea that after the deluge seven men and women had come out of a cave, which they call 'Paccari Tampu,' five leagues from Cuzco, where a window was carved in masonry in most ancient times; that these persons multiplied and spread over the world. Hence every province had a like place of worship, where people came forth after the

* Published in vol. xlii., 1872, page 513, of *Royal Geographical Society's Journal*.

† *Vide Nature*, February 19th, 1874, page 313.

‡ *Rites and Laws of the Incas*, translated from the original Spanish Manuscripts, by Clements R. Markham, C.B., F.R.G.S. London, 1873. Printed for the Hakluyt Society. Page 153.

general (?) destruction ! and these places were pointed out by their old men and wizards, who taught them why and how the Incas venerated the caves of Paccari Tampu."

Relation of the dynasty proceeding from what is styled "the cradle of the Incas," namely, Lake Titicaca, is thus told by Garcillaso de la Vega (A.D. 1609), on the authority of his uncle.* "Our father, the Sun, seeing the human race in the condition I have described (like beasts or worse, chap. x., page 50), had compassion on them, and sent down from heaven to the earth a son and a daughter to instruct them in the knowledge of our father, the Sun, that they might adore him and adopt him as their god ; also to give them precepts and laws by which to live as reasonable and civilised men, and to teach them to live in houses and towns ; to cultivate maize and other crops ; to breed flocks, and to use the fruits of the earth like rational beings, instead of living like beasts. With these commands and intentions, our father, the Sun, placed his children on Lake Titicaca, which is eighty leagues from here (in Cuzco), and he said to them, that they might go where they pleased, and that at every place where they stopped to eat or sleep, they were to thrust a sceptre of gold into the ground, which was half a yard long and two fingers in thickness. He gave them this staff as a sign and a token, that in the place where, by one blow on the earth, it should sink down and disappear, there it was the desire of our father, the Sun, that they should remain and establish their court !" Finally he said to them : "When you have reduced these people to our service, you shall maintain them in habits of reason and justice, by

* Vide Mr. Markham's *Translations of the Royal Commentaries for the Hakluyt Society*, 1869, vol. i., p. 64, chap. xv. Garcillaso, having left Peru on his father's death, in A.D. 1550, must have been a lad of wonderful memory to have treasured his uncle's legends for more than half a century, as the first part of these commentaries was licensed by the Inquisition in 1604, and published at Lisbon in 1609.

the practice of piety, clemency, and meekness, assuming in all things the office of a pious father towards his beloved and tender children. Thus you will form a likeness and reflection of me. I do good to the whole world ; giving light that men may see and do their business, making them warm when they are cold, cherishing their pastures and crops, ripening their fruits, and increasing their flocks, watering their lands with dew, and bringing fine weather in the proper season. I take care to go round the earth each day [the Sun spoke this, I may casually observe, before it was discovered that the world turns round him, and not he round the world], that I may see the necessities that exist in the world, and supply them as the sustainer and benefactor of the heathens. I desire that you shall imitate this example, as my children, sent to the earth solely for the instruction and benefit of these men who live like beasts. And from this time I constitute and name you as kings and lords over all the tribes, that you may instruct them in your rational works and governments." Having declared his will to his children, our father, the Sun, dismissed them. These youths set out from Titicaca, and travelled northwards, trying at every place where they stopped on the road, whether their sceptre of gold would sink into the earth, but it never did. At last they came to an inn, or small resting-place, which is seven or eight leagues south of the city, and is called *Paccari Tampu** (that is to say, the resting-place of the dawn). The Inca gave it this name because he set out from it in the early morning.† It is one of the towns which the prince afterwards ordered to be founded, and the inha-

* "*Paccari*," morning, and "*Tampu*" (corrupted by the Spaniards into *Tambo*), an inn.

† Such a derivation may appear, under the circumstances, to have been on the "*lucus a non lucendo*" principle, whereas, if he had arrived there in the dawn, and stayed to rest, instead of setting out, one could understand its proper signification.

bitants are very proud of the name to this day, because it was given by the Inca. From this place he and his wife, our queen, advanced to the valley of Cuzco, which at that time was entirely covered with wild forests."

The difference between this account of the first appearance of the Incas and that of Polo de Ondegardo, written fifty years previous, deserves a little consideration. The only resemblance wherein they participate is in the single word "*Paccari Tampu*," which, by the first authority, is translated as a cave in connection with "a window carved in masonry" (whatever that may mean); by the other is expressed as an inn, or resting-place, for the dawn. In the account given by Garcillaso de la Vega, and above fifty years after his uncle told him of it, we find that the first Incas created by the Sun, a little over eight hundred years ago, or shortly before the time of our English William the Conqueror, were a son and daughter,—in fact, sister and brother; that their cradle-life was passed in Lake Titicaca; that they were sent to seek their destiny with a golden wedge, that was to stick in the ground wherever they were to settle; that their habits of "piety, meekness and clemency" were handed down through several generations of the brother and sister, being developed into the man and wife; and thus the great power of the Incas originated. For, on the day that they started from "*Paccari Tampu*," and as they came to a hill called "*Huancanti*," to the south of Cuzco, "the sceptre of gold buried itself in the ground and was never seen more."

The programme which follows this* is too much of a playbill style of arrangement wherewith to occupy your time. It is given in two succeeding chapters, with inverted commas, as quotations from the uncle's account related more than half a century previous. The gist of it, I may explain,

* *Op. cit.*, Vol. i., chapters xvi. and xvii., pp. 65 to 70.

consists in that the Prince, or Inca, having gone to the North, and the Princess (wife and sister) to the South, they spoke to all the people they met in the wilderness. To prove they came from the sun, they were attired and adorned with ornaments, as well as had their ears bored and opened, "in the way that we their descendants wear ours," and with other like conclusive evidences of their divine origin, as of the truth of their mission. In fact, everything went *en regle*. The Inca king taught the men how to cultivate ground, to sow corn, to make ploughs, to lead channels from the brooks (called *azequias* by the Spaniards), and even instructed them how to prepare sandals such as were worn in Garcillaso's time. The queen instructed the women how to sew and weave cotton and wool, to make clothes for themselves, their husbands and children, as to perform other household duties. But this part of the tale lacks stability, when I produce to you works of art in pottery, silver, and cloth, taken from burial grounds that the celebrated Professor Agassiz, when I saw him the year before last at Callao, believed were more likely to have been constructed thousands of years gone by, than within the same number of centuries to which the Inca dynasty is limited.

Between the first mentioned work of Polo de Ondegardo, A.D. 1550, and that of the Inca historian Garcillaso de la Vega (himself of Inca blood likewise) in 1609, or more than half a century, we have enumerated by the latest authoritative writer on Peru* seven other authors. Of these the one most to be relied on is Cieza de Leon (A.D. 1554), whose work was published after he had been seventeen years in the Indies (meaning South America). Two other books of his, never published, are reported as having been left in MSS. at

* *Geographical Position of the Tribes forming the Empire of the Incas*, by Clements B. Markham, C.B., etc. — *Journal of Royal Geographical Society*, Vol. xii., 1871; p. 282.

Madrid after his death. Of his *Cronica del Peru*, Prescott gives a very commendatory and flattering account,* chiefly as regards its topographical accuracy in the position of places, which at the time he wrote was a difficult matter to make sure of in a cruise along the coast. But it is a melancholy fact for us to know now, that whilst Prescott, during his investigations at Madrid, was quoting largely from the MSS. of an author named Sarmiento, the MSS. in question, which this last named had pretended to be his own work, and put his name to, is now proved to be the second part of the *Chronicles of Peru*, by Cieza de Leon, that had been stolen, and therefore, previous to his death had not been published. It was only during the last year this discovery was made, by an eminent Peruvian archæologist in London, Senor Gonzales de la Rosa.†

Another account of the first appearance of the Incas is given by Ferdnando Montesinos (A.D. 1652), who is thus apostrophised in the volume of *Royal Geographical Society's Journal* last referred to: "Fernan Mendez Pinto was but a type of thee, thou liar of the first magnitude"!!!!

He tells us, "Peru was populated five hundred years after the deluge (or above two thousand years previous to the Garcillaso epoch)." Its first inhabitants flowed in abundantly towards the Valley of Cuzco, conducted by four brothers (whose names require too much space to give), who were accompanied by their sisters in the capacity of wives. The eldest of the brothers mounted to the summit of a ridge, and threw with his sling a stone to each of the four quarters of the world, thus taking possession of the soil for himself and family. To each of the quarters he gave a Quichua name. Of these four brothers, the youngest soon proved

* *Conquest of Peru*, Vol. ii., p. 297.

† *Vide Athenæum*, July 5th, 1873, or Author's *Two Years in Peru*, vol. ii., p. 108.

‡ *Antes citado*, p. 284.

himself the most skilful and hardy, by getting rid in a short time of the three elders, one of them being cast into a cave, the other thrown into a pit, and the third frightened to fly away into a distant province. Then this fratricidal first of the Incas consoled his sisters (he must have been very persuasive, and they no less susceptible to consolation, to have taken to it after the loss of their husbands), and told them that they must consider him as the only child or son of the Sun, and obey him as such. He commanded his kinsmen to level the ground, and make houses of stone. Such was the origin of the city of Cuzco. For sixty years did this monarch govern. His name was Ayar-Neha-*Topa*, and he left the throne to his son, Manco Capac; so that we find it difficult to reconcile the first Inca, Manco Capac, of Montesinos, who ruled in Peru five hundred and sixty years after the deluge, and who was succeeded by one hundred monarchs, with the first Inca, Manco Capac of Garcillaso de la Vega, created by the Sun only eight hundred years ago, in A.D. 1021, and who had no more than fourteen Incas intervening between his time and that of Atalmalpa,—murdered by Pizarro at the time of the Conquest. One thing may be advanced in favour of Montesinos, that he spent fifteen years in Peru, and studied its archæology with wonderful assiduity. At least so Dr. Tschudi records. Stevenson* relates that at Huacho, and in the beginning of this century, he heard the oral tradition of the first Inca, Manco Capac. This was to the effect of a white man at some remote period having been found as a castaway on the coast by a cacique, or head of a tribe, named Cocapac; that in reply to the question, put to him by signs, of “Who are you?” the white man answered, by signs likewise, that he was an *Englishman*. And I must confess that, although I

* *A Historical and Descriptive Narrative of Twenty Years' Residence in South America*, by W. B. Stevenson. 8 vols. Hurst, Robinson & Co. 1825. Vol. i. p. 827.

have passed some hours in cogitating over how such an answer could be given by signs, I am still puzzled as to the *modus operandi*. At all events, the cacique took him to his house, and in a short time he fell in love with his daughter and married her. She bore him a son and a daughter, and the old cacique died; but before this last event took place, Cocapac had given the name of Ingasman Cocapac to his son-in-law (shortened into Manco Capac as Richard is to Dick, or William to Bill), and brought him, together with his daughter Mama-Oclee over the Andes to Cuzco,—a trifle of six hundred miles or so,—across such fourteen to sixteen thousand feet high of mountain masses as cannot be imagined with regard to difficulty of transit except by those who have seen them. There he told a tribe of Indians that their god, the Sun, had sent two children to govern them and make them happy. He further said that if they would accompany him to a certain mountain next morning at sunrise, they would find the new comers (who had been drilled to play their parts), with their hair like the rays of the sun, and their faces the colour of that orb. But the Indians were not to be gulled, and only sent up a few detectives to transport the pair, now looked on as a wizard and witch, down to Rimac Malca, the plain upon which the city of Lima now stands. How they effected the journey we are not told, but the legend becomes the clumsiest of fables when we know the distance from Cuzco to Lima is from six to seven hundred miles, across Andes covered with perpetual snow, and in a country where even nowadays, outside the railway track, no possible subsistence or aid for travelling can be obtained.

Back again, however, the old cacique went, to Lake Titicaca, where he found other more amenable Indians, for the latter at once took up the cause of the young pair being descendants of the Sun. Then occurred the same as happened in Garcillaso's story—the march from the lake

with the wedge of gold. The old tale of its refusing to stick at any place till it came to Cuzco, where the people who had rejected them before joined to the numbers that accompanied them now, acknowledged them as their Lords and the children of their God.

The account given by Pedro Cieza de Leon* of the first origin of the Incas is simply that, whilst the devil was playing his pranks with the people in the province of the Collas and the valleys of the Yuncas, two brothers rose up (he does not say whether from the lake, the provinces, or the valleys), the name of one of whom was Manco Capac. The marvels and fables repeated by the Indians about these Incas and their successors were to have been published by Cieza de Leon. But the second, third, and fourth parts of his work have not appeared, for reasons of piracy I have already explained. Some of it is still in MSS. at Madrid, whilst another segment, referring to the civil wars of Peru, is said to have been sold to Mr. Lennox, of New York.†

In his celebrated *Pilgrimage* (second edition, 1614), Samuel Purchas thus quotes Lopez de Gomara and Apollonius: "The Peruvians have a tradition concerning the Creation, that at the beginning of the world came one from the North intoo their countrey called Con, which had no bones, went very light, and swift, cast downe mountaines, lift up the hills, only with His will and word. He said He was the sonne of the Sunne, and filled the earth with men and women which he created, giving them fruits, and breade, and other things necessary for human life. But being offended with some, he countermanded all that former good, and turned the fruitful lands into barren sands, as they are now in the plains, and took away the water that it should not raine (hence it came that it raines not), onely leaving

* *Travels of Pedro Cieza de Leon*, translated by C. Markham, Esq., p. 136.

† *Vide Preface to Travels*, p. xvii.

them the rivers of pure compassion that they should maintain themselves with labour."

This clumsy allegory in reference to the fact of rain never falling on the Pacific coast of Peru is only equalled by a somewhat similar extravaganza about the gold that was brought away, as well as that which was left behind. In fact, the stories of gold in what Purchas calls "the palace of Guaynacapa, Emperor of the Ingvas," put Munchausen entirely in the shade. I may add, however, *en parenthese*, no such name of an Ingua, Inca, or Ynca, as that of Guaynacapa is recorded by either Montesinos or Garcillaso de la Vega. Of the gold first brought home by Pizarro we are told :

" They carried into Spaine one vessell of Golde, another of silver, each sufficient to boile a cow, besides a huge Eagle, and other like Images, as an idoll of Golde as big as a childe of foure yeares olde ; drummes of Golde ; and at the conquest of Cuzco, Xeres tels of many images of women of Golde, and as great, which they worshipped, and divers like of silver, sheep also in like portrature, of fine Golde ; all well wrought."

Of that which was left behind in the palace of Guaynapaca it appears :

" All the vessels of his house, table and kitchen were of gold and silver. He had in his Wardrobe hollow Statues, which seemed Gyants, and were of Golde ; and the figures in proportion and bignesse of all the Beasts, Birds, Trees and Hearbes in his kingdome, and of the fishes likewise. Hee had ropes, budgets, troughs and chests of golde and silver ; heaps of billets of gold that seemed wood cut out for the fire. There was nothing in his kingdome but had the counterfeit in golde. Yea, they say that the Ingvas had a garden of pleasure in an Iland neere Puna, which had all kinde of garden-hearbes, flowers, and trees of golde and silver."

The Xeres referred to in the foregoing extract was Francisco de Xeres, Secretary to the Conqueror, Don Fran-

cisco Pizarro. The original edition of his *True Account of the Province of Cuzco* was published at Seville in A.D. 1534. The work has been lately reissued in London, translated for and published by the Hakluyt Society.* It is full of anomalies, not the least remarkable of which is the translator's setting down to misapprehension opinions given by Prescott, Sir Arthur Helps, Rivers, or anyone who in the slightest degree doubts the Inca pre-eminence, or differs from his own dogmatic statements. The narrative tells us at the end that it was written *by order* of Francisco Pizarro, who it is well known could neither read nor write. All through the work, the word Inca does not occur; possibly it was not invented at the time, for Garcillaso's history did not appear till more than half a century after. The kings of the period are styled *Old Cuzco*, and *Young Cuzco*, the *Son of Old Cuzco*; the reigning monarch, Atahualpa, is entitled Atabaliba. The people under the wise dispensation of the Peruvian Yncas, as it is subsequently described, are thus represented near Caxamalca:† "Each month they sacrifice their own children, and with the blood they anoint the faces of the idols, and the doors of the Mosques."

Putting people to torture as he went along, Pizarro proceeded to Caxamalca, accompanied by several clericals, and a force of 160 soldiers, all told. At Caxamalca he found the great Atahualpa, or Atabaliba, ready to receive him at the Royal Baths. The circumstances connected with this visit are so well known that it is unnecessary to recapitulate what we find so graphically described by Prescott—of the sudden onslaught of the Spaniards on the unsuspecting Indians—of the capture of Atahualpa—and of his having volunteered to fill with gold a room twenty-two feet long and seventeen

* Reports of the *Discovery of Peru*, Translated and Edited, with Notes and an Introduction, by Clements R. Markham, C.B., etc. London: Printed for the Hakluyt Society.

† Page 88.

wide, to a white line half way up the wall—of his subsequent mock trial, and of his being strangled before all the gold had arrived. The height of the room was of a man's stature and a half, or about nine feet. But Xeres tells us that twenty thousand men were killed by the Spaniards, and the slaughter only lasted half an hour, from which it may appear (if any of my hearers doubt it, and wish to do a little sum in common division), that, 160 men killing 20,000 in 80 minutes, every man knocked off at the rate of four victims and a fraction per sixty seconds. Of the Spanish forces only one horse was slightly injured in the fray; and for all these and such mercies Pizarro gave thanks to our Lord God. That little faith can be placed in the narrative of Secretary Xeres, may be inferred from the enormous exaggerations in nearly every page of it. How much even the translator himself distrusts him may be inferred from the following passage:* “The pretext for murdering Atahualpa was false, and Xeres, the murderer's secretary, knew it was false when he wrote the narrative.” It would seem to be no small advantage to the cause of truth, if we could ascertain how much more of the memoir the murderer's secretary knew to be false when he wrote it — “by order”!!

With this relation of Secretary Xeres is dovetailed the narrative of a journey made by El Senor Captain Hernando Pizarro, by order of the Governor (his brother, Francisco Pizarro, the Conqueror), from the city of Caxamalca to Parcama, and thence to Xauxa. The last named is written by Senor Don Miguel Astete, no doubt “to order” as the first was. Parcama, the translator, tells us it was meant for Pacha-Camac.

The journey of Cieza de Leon is nearly along the coast, at part of which, near Parpunga, or Parmunca,† they saw broad

* Page 182.

† Page 79.

roads, made by the people of the coast (not by the Incas). From the description of this route, I can see they stopped at Huatica, which is no doubt the place mentioned of halting before the night at Pacha-Camac. Not a word about the Incas at any place here.

Though Hernando Pizarro had with him only twenty horse, and a few arquebusiers, he was received everywhere with friendship. The several Lords of the neighbourhood came with presents of gold and silver to offer him, together with submission to the Spanish king; amongst them "Tau-richmuti, at the period King or Lord of Pacha-Camac, the Lord of Malaque (or Mala), named Limoto, and half a dozen others, down as far as the Chinch Valley, all with tribute, and all offering submission. I cannot avoid recognising a little confusion in Senor Astete's account of the speaking idol of which he writes here as kept in a very dark chamber, with a foetid smell. All he tells us about the so-called "Sun Temple" is that, "Adjoining the mosque (where the wooden idol was) is a house of the Sun, well built, and situated on a hill, with fine surrounding walls." But not a word about the reputed Virgins, and their large cloisters, or of Incaism in any shape or form.

From the latest published work by the Hakluyt Society,* in reference to Inca lore, we have the changes still rung on fables and rites of the Incas, with narrative of the errors, false gods, and other diabolical diversions in which the Indians of the Province of Huarochiri indulged through ancient times previous to the civilisation of the Incas. That this latter was a manifest failure may be inferred from the fact, that in the so-called pure Inca worship a very general feature was the sacrifice of virgins, as well as strangling

* *Narrative of the Rites and Laws of the Incas*, translated from original Spanish MSS., and edited, with Notes and Introduction, by Clements R. Markham. London. Hakluyt Society, 1873.

children, and burying them alive,* in honour of the deity, and in taking from some the hearts while yet alive, and offering them while still palpitating."

To sum up. Only eight centuries having intervened since, according to what we are asked to credit as orthodox authority on the subject, the Incas made their first appearance in Peru, I feel compelled to set down the following fallacies about them, which I hope some future explorer will endeavour to elucidate with more confirmation. I may here add that I never went to investigate the archæology of Peru in the character of a professional traveller. All my notes were taken and arranged, and all my reading was done, in the leisure hours of my very busy consular avocations at Callao. But my two years in Peru bring me to the following conclusions:—

1st. In our common sense age, we must repudiate the fallacy of the early Incas (brother and sister) having been created by the Sun, nursed in Lake Titicaca, and settled themselves as man and wife at Cuzco, through the fact of the wedge of gold which they carried being swallowed up on that spot.

2nd. I find equally as fallacious the story of Polo de Ondegardo, about the seven men and women who came out of the cave called "Paccari-Tampu," after the deluge, and of their having got along so well as thus rapidly to multiply and increase, subsequent to what we are asked to believe as the "general destruction."

3rd. The fallacy of the whole grandeur of early civilisation in Peru being claimed for the Incas I believe to be a delusive sham, for although we are told of the wonderful discipline and organisation of *chasquis*, or messengers, as of the chronicles recorded on their hieroglyphic *quipus*, these require more proof to substantiate them than that of a

* *Vide Athenæum* of 22nd November last.

story that fish was brought alive from the sea to Cuzco — in some places a distance by foot messengers of one hundred leagues, or three hundred miles — in two days; on one occasion from Tumbes to Cuzco, a journey of nearly one thousand miles; and in each case the fish are chronicled to have arrived “all alive, O!” It is not the distance that makes one doubt the story so much as the fact of the journey from sea to Cuzco, at any point, needing an ascent of from fourteen to sixteen thousand feet, through rugged mountain fastnesses, or even on the smoothest of turnpike roads, where the air being so rarefied water cannot boil, and consequently fish would likely feel uncomfortable.

4th. All the writers about Peru, following in the track of the early Spanish compilers, try to make us believe that the Inca dynasty has a prerogative right to the prestige of all the grand old roads, the ruins of forts and castles, the azequias or water courses, the pottery ware and manufactures, as well as works of art in silver and gold.

5th. Following Garcillaso de la Vega, we find that when the Incas came on their first invasion to the Coast territories, about five hundred years ago, or two hundred antecedent to the Spanish invasion,* they brought with them a force of thirty thousand men, and a reserve of thirty thousand more. The latter was left at Runcana, under the charge of the Inca king Pachacutec, whilst the other half came over with the king's son, Prince Yupanqui, and the king's brother, General Cocapac Yupanqui. The valleys invaded on this first attack were those of Nasca, or Nanasca, Ica (Yca), Pisco and Chincha, all of which are contiguous to each other. Passing over any of these at the present day, the traveller cannot avoid being struck with wonder at the immense extent and variety of ruins, with which they abound. The historian† describes the entrance of the Inca troops amongst

Vide Garcillaso de la Vega. Vol. ii., chapter xvii., p. 147.

† *Op. cit.*, p. 147.

these people as a walk over ; after which he tells us that the “ valley of Yca, like all the other coast valleys, is fertile, and these Kings Yncas enriched it with a most splendid aqueduct, which they ordered to be constructed from the mountains,”—to which the translator adds, “ Garcillaso is mistaken. It was in the Valley of Nasca, or Nanasca, that these magnificent irrigation works were constructed by the Yncas. They are still in good preservation.” On which I may observe, as far more likely, the waterworks in question were the handiwork of the Yuncas, who were now being invaded, and were swept away by the waves of conquest. If I be asked my reason for this opinion, it is simply that without artificial aqueducts in these valleys, the cultivation of fruits of the earth* could not be carried on, as there exist no rivers here. Moreover, in the next chapter and page we are told “ the people in the Chincha valley, which was reached in a few days, resisted the invaders. In fact, they fought like men defending their hearths and homes, whilst the army of the Inca had to be replenished several times from Cuzco. They had at length to give in, not from being cowed by fighting, but by the Inca “ destroying the crops and fruits of the earth, that they might perish by hunger. Worse still, the invader ORDERED THE WATER-COURSES TO BE DESTROYED, SO AS TO PUT A STOP TO IRRIGATION on land which he could not desolate. This was what the Yuncas felt the most, for the climate being so hot, and the power of the sun so great, *it is necessary to irrigate the fields every day, that they may bring forth fruit.*”

Every one who has seen the coast valleys of Peru, and knows that it never rains amongst them, cannot fail to recognise that there could have been no fruits of the earth there to destroy, if there had not been previously water to raise them. And common sense teaches us such water must

* *Op. cit.*, p. 161, cap. xviii.

have been brought there by means of conduits made by the Yuncas, the original holders of the soil, before the Inca invasion. Whilst allowing the Incas, wherever they came from originally, to have established an empire in the heart of Peru, I cannot recognise any sign whatever of its having extended to the coast valleys, that is to say, so far as their discipline and executive were concerned. I believe the proper history of Peru can only be ascertained, and the fallacies which I have enumerated, with a hundred others, be cleared off, when extensive and minute examination is made into their mounds and ruins, the quantity of which on the sea coast valleys is something prodigious. "The mounds and their contents," says the eminent North American archæologist, Mr. Squier, "as disclosed by the mattock and the spade, serve more particularly to reflect light upon their customs, and the condition of the arts amongst the natives who built them. Within these mounds we must look for the only authentic remains of their builders. They are the principal depositories of ancient art; they cover the bones of the distinguished dead of remote ages, and hide from the profane gaze of invading races the altars of the ancient people."

Examining into these will throw more light into the state of prehistoric civilisation, represented by arts, manufactures, and architecture, than dozens of volumes of the most minute philology on such idioms as the Quichna or the Aymara. Because neither of these having been at any time a written dialect, its grammatical formation must depend on the compiler. Even when the syntax and prosody of an unpublished tongue be strung together, what can it tell?

6th. I had been twelve months in Peru, and was often told (as I passed them every day, between Callao and Lima,) that these mounds, of which I have sketches here, were Huacas of the Incas, as well as occasionally that they were of natural

formation. Of the grand mounds in the Huatica Valley, we have as yet no account, although they are only four to five miles outside of Lima. I find no records of the Incas having been down here, except when on their conquering march five hundred years ago. Some of these forts, as that of San Miguel, called so by the Spaniards, have rooms in them almost as large as the long room in St. George's Hall, yet these are all filled up with clay. In them, too, I found the zodiacal measurements, or multiples of twelve. Of this you will see accounts in my last work, *Two Years in Peru*, of which I have the honour, Mr. President, to offer, through you, a copy to the library of the Liverpool Literary and Philosophical Society.

Finally, I hope that any future explorers into Peruvian archæology will bear in mind, that no small amount of the prehistoric pottery ware that I have excavated in Peru bears a very strong resemblance, in variety of colour, in mould, and in material, to much of that recently discovered by Dr. Henry Schliemann, in the ruins of Homer's Ilium. We therefore require a deeper investigation into the earlier history of Peru, more especially as relates to the Inca peoples, in order to ascertain, if possible, their ethnological relationship with any of the past or the existing races of mankind.

THE PAST AND FUTURE OF THE NILE BASIN.
By SIR SAMUEL BAKER.

It is universally admitted that the more we know the greater is the desire to extend our knowledge. The knowledge of to-day may a century hence be considered as the ignorance of a past age, in the same manner that we, in 1874, look back to the comparative darkness of a hundred years ago. In geographical research we have within the last century made extraordinary strides, in reducing to a practical result the discoveries of the great explorers of the middle ages ; but at the same time that we may justly boast of the scientific position attained by geography, we must pay a high tribute to our remote ancestors, who so gallantly ploughed through unknown seas, as the precursors of the great colonial world that has arisen through their discoveries. When we regard with pride the present wealth and the enormous scale of the commercial interests of Great Britain, we should look back with renewed interest to those first seeds that were sown, which have produced such extraordinary fruits. We at once trace the footsteps from the present to the distant past, until we discover the original explorer. To him we owe our thanks for the prosperity of the present ; to those hardy pioneers and gallant sailors who first circumnavigated the world, who, trusting in the guidance of Providence, but with hearts of oak, started on unknown seas, without compass or other guide but the uncertain stars. Thus we find that at a remote period there were nations who took the lead in maritime affairs, and it is interesting to analyse the spirit that first prompted such dangerous enter-

prises or explorations in unknown seas and lands. This spirit of adventure and exploration, which naturally resulted in maritime superiority, was closely allied with an instinctive commercial talent. We find at the earliest historical periods that the great cities of Tyre and Sidon—the London and Liverpool of eastern commerce—were the grand mercantile depôts of the Phœnicians, who were then the first mariners of the world. At that time Britain was in a state of barbarism; but it is supposed that even at that remote period those hardy merchants, the Phœnicians, had discovered the rich tin mines of Cornwall, and that their ships traded direct to obtain that precious metal with which they manufactured the celebrated bronze of the ancients. In those days the compass was unknown; there were no astronomical instruments to verify the vessel's course; the world was assumed to be a square; there were no charts, where currents, shoals, and rocks were accurately described; but the ship depended upon a good lookout ahead and thorough seamanship. Notwithstanding these terrible difficulties, added to the inferiority of weapons at that period, we find the Phœnicians navigating not only the Mediterranean and the Eastern shores of the Atlantic, but their fleets held possession of the Red Sea, traded on the Indian Ocean, and at length circumnavigated the vast continent of Africa. It was the commercial spirit that was the foundation of this spirit of exploration. This resulted in a life of adventure, which was attended with dangers on all sides. The character of the people, nurtured in activity, both mental and physical, accustomed to the difficulties inseparable from hazardous enterprise, the combination of commerce with the excitement of dangerous expeditions, all tended to form a nation of hardy, intrepid explorers; and the Phœnicians became the great pioneers of commerce and of geography—commerce being the result of geographical research.

A great work has been accomplished in modern times by the completion of the Suez Canal ; but it must not be forgotten that the Phœnician fleet passed through the isthmus when the Persians occupied Egypt. In those days the labour was entirely manual ; there were no steam dredges, or other modern appliances, but the canal was the work of simple hand and arm. All this admirable energy has passed away. We can only look back and regret that the great spirit of the East which first enlightened Western nations is simply an historical tale. Phœnicians, Egyptians, Carthaginians were great lights, that were extinguished by that hurricane of Islamism which, by the Mahomedan conquest, threw a " darkness that might be felt " over Asia Minor and Northern Africa. Those magnificent countries, the pride of ancient days, have withered under their fanatical conquerors. There will always be a commercial equilibrium throughout the world. If certain countries disappear from the surface, others will rise to their former importance. The ruin of the East was succeeded by the development of the West. The great military movement of the Crusades, when all Europe marched against the infidels, was a starting point for general improvement. In those days the difficulties of travelling were enormous. These were increased by the dangers of brigandage and general insecurity of life and property. Thus few persons ventured into distant lands ; accordingly their wants were confined to the few necessaries of the society to which they had been accustomed. The general movement of the Christian West, to attack Islamism in the distant East, took great multitudes upon a journey through Europe to Palestine and Egypt, which countries they would otherwise never have visited. Thus intercourse was established. The manufactures of one country were desired by the strangers, and interchange of commodities took place. New tastes were formed, which created new wants. Eastern

luxuries were coveted, and at length trade took a definite shape, until commerce extended, and was eventually fully developed by the Genoese and Venetians.

The Portuguese at length took the lead in exploration. This small but energetic nation was quickly rivalled by the Dutch. The discovery of America by Columbus commenced a new era in distant explorations, and the world received constant additions from the discoveries of adventurers. In the short space of a lecture, it would be impossible to follow up the successive discoveries of various nations which resulted in the colonisation of the East and West. In Africa, the Dutch formed an important colony at the Cape of Good Hope, while the Portuguese took the lead in forming settlements both on the east and west coasts. England was at that time far behind, and our maritime superiority commences so late as the reign of Elizabeth. It then became the fashion to enter upon foreign adventures. The names of Drake, Frobisher, Sir Walter Raleigh, and others will always be associated with British enterprise and daring. The destruction of the Spanish Armada gave an impulse to the development of our navy. The spirit of maritime adventure increased the desire for commerce, and England quickly took her position in the front ranks of the commercial world. From this time till the end of the Commonwealth the naval and commercial power of England rapidly increased, until, by the misgovernment of Charles II., we fell from the first to even the third rank. Ships were rotting on the stocks, and nothing could exceed the demoralisation of our navy. There cannot be a more striking example of the disastrous effects of a bad Government. We here see an instance of rapid retrogression. A country that had become commercially important, with a navy that had shattered the armaments of Spain, was reduced to utter insignificance, simply through a bad administration.

The reaction that followed from the death of Charles resulted in an almost unbroken series of improvements. From that time, although England had not taken the first rank in the actual discovery of new lands, her successful wars left her not only mistress of the seas, but she became the possessor of vast colonies, which span the globe as with a girdle. England, who had been in the rear rank of discoverers, now came forward not only as the coloniser, but as the mother that would people all those lands that were suitable for the occupation of the Anglo-Saxon race. This race appears destined to be the civilising instrument of the world. There is an amount of physical hardihood and endurance in the Anglo-Saxon that enables him not only to exist, but even to multiply, in foreign countries, which renders him the great coloniser of the globe. It may be accepted as a rule, that in all those countries where the wool-bearing sheep succeed, an equal success will attend the colonists. Thus, such climates as are favourable to European sheep are equally favourable to the European constitution.

In the short space of three hundred years America has become a giant; Australia will in a still shorter period assume immense proportions; India is in itself an empire. The great Queen Elizabeth, of whom England is justly proud, ruled over some seven million subjects, while our present Queen Victoria now reckons two hundred and forty millions. This enormous increase of British subjects is the greatest proof of the extraordinary advancement of British prosperity. Every individual subject is a consumer; each person has personal requirements, that must if possible be supplied. Thus an extraordinary population creates an extraordinary demand, which results in an extended commerce.

With the steady increase of national prosperity in our own country, the retrogression of countries that had ranked

high in the world's history stands in prominent contrast. We have already noticed the change worked throughout Northern Africa by the fanaticism of Islamism. We have seen ancient Greece trodden under foot by the Mahommedan conquest, and changed into modern Turkey; and we see Italy and Spain reduced from their ancient grandeur to their present condition. In this fall of empires and the decrease of prosperity, we can read a grave and important lesson. If we take an unprejudiced survey of the world, we shall find that all countries that have decayed are those which have been fettered by priestcraft and fanaticism. The Sultán of Turkey is the Caliph or representative of the Mahommedan Church, and Mahommedanism has desolated every country where it held its sway. The infallible Pope has been represented in the heart of Italy; the Inquisition had its secret halls in Spain. These two important countries have been priest-ridden for many centuries. These are examples of the blessing that the Pope of Rome would extend to Ireland.

When we take a general view of the world, and boast of our present prosperity, we are reminded that the development and success of a colony or country does not exclusively depend upon the Government. Although a country with grand material resources can be neutralised by a dishonest or an apathetic Government, it may be practically impossible for a Government (even if perfect) to produce prosperity where the population is naturally averse to steady labour. There are races of men as different as the varieties among animals. There are industrious populations who must and will succeed, no matter under what disadvantages they may labour, precisely as there are individuals of indomitable will and determination that nothing can defeat. When we look around us, and count our colonies as our treasures, the philanthropist may be somewhat disappointed at the result. The original inhabitants of America and Australia have not

embraced the civilisation offered by their conquerors. The prosperity of these countries has been the result of the foreign human element that has been introduced, and is entirely due to the energy of the stranger, but not to the industry of the aborigines.

Within a few hours of this spot, we have an instance of the powerful theory that prosperity depends upon race. We all know that England was divided into small kingdoms during the Saxon Heptarchy, but that, eventually, we became one kingdom, and after bloody wars we conquered Wales. Scotland was a foe worthy of our steel, but we now rejoice that we are irrevocably united as Great Britain, and cast together as inseparably as two metals in the same crucible. The Scotch succeed in whatever land they may cast their lot. The progress of Scotland during the last century has been without a parallel. It was the river Clyde that bore the first steamer ever launched; this was two years before a steamer appeared on the river Thames. It was Bruce of Kinnaird (a Scotchman) who first travelled to the sources of the Blue Nile. It was Grant (a Scotchman) who, together with Speke, first marched from Zanzibar to Cairo. It is the lamented Livingstone (a Scotchman), that Achilles among African explorers, whose body, borne by his faithful followers, is on the mournful route to his last home; and the gallant 42nd are Scottish Highlanders, who now have carried their renown through African jungles to Coomassie.

Now, as we rejoice in the strength of our right arm with the same regard that we feel for the left, in the same degree are we proud of Scottish achievements in our friendly rivalry. We feel that we are members of the same body, with one heart, beating with the same loyalty. Ireland is separated from us geographically by a narrow channel; but morally and physically she presents a sad contrast to the bright picture of the north. Popery may not be the only cause;

discontent may perhaps be only skin deep; but when we regard the position of Italy and Spain, the suspicion is awakened that priestcraft, that has caused the decay of those countries, is the same cancer that exhibits its malignity to the body of the State in the ulcer of "Home Rule."

The immutable laws which affect special races of men render a fusion of the Irish and English elements as difficult as the mixing of oil and water. This difficulty of fusion with an alien race is the general drawback to successful colonisation. In savage countries experience teaches us that the original inhabitants recede before their conquerors, but seldom amalgamate. In a civilised country like Ireland, in spite of intermarriage, the conquered race retains the unconquerable antipathy of an alien origin.

In wild countries, the success of a colony must depend upon fertile soil, an industrious population, secure harbours, and inland facilities of transport. It is by no means necessary that the staple commodities should be indigenous. In past experience we find that, in most of our flourishing colonies, both the vegetable and animal productions which form their wealth are the result of importation and acclimatisation. Thus, in Australia, the sheep were introduced from Europe, which now yield an enormous supply of wool. There was no coffee shrub indigenous to Ceylon, but the large yield from that important colony is the result of imported seed. In Mauritius the sugar-cane was also imported. Therefore, in estimating the probable value of a new colony, we must be guided by the quality of soil, climate, and general capabilities, rather than by its natural productions. Here the explorer is the pioneer of commerce. An observant traveller will not only report upon the productions, but upon the agricultural resources, of the new lands that he brings to the world's notice.

We have an instance of the comparatively recent develop-

ment of a cotton-producing country that is especially interesting to Liverpool. In the early reign of Mehemet Ali Pacha, the great ruler of Egypt, cotton was unknown in that country. A Frenchman, who as an explorer visited the Soudan, discovered cotton growing as an indigenous plant, which he at once recognised as that described by Pliny as the "wool-bearing trees of Ethiopia." He introduced the seeds to Mehemet Ali Pacha on his return to Egypt. That far-sighted man immediately perceived the advantage, and he commenced the cultivation of cotton on an extensive scale. Since the death of Mehemet Ali (the grandfather of the present Khedive) we have seen the importance of Egypt, as a country that not only produces cotton in great quantities, but yields to our markets the finest quality.

The great rulers of the commercial world are cotton, coal, and iron, all of which exhibit their importance by their enhanced price consequent upon an increased demand. It is therefore the self-evident interest of England to ensure an unbroken supply of these important materials, upon which our commercial pre-eminence depends. We have witnessed the distress occasioned to our operatives by a sudden scarcity of the raw material of cotton during the American struggle, and that melancholy fact should operate as a powerful warning to England. We have to look well into the future, and provide for political contingencies; and we must admit that a dependence upon America during a general war would be most insecure. We must search for a better protected journey than the broad Atlantic. From my experience of the Egyptian territory, I believe that with careful development we may become entirely independent of America for our supply of cotton. One of the first *desiderata* in all commercial enterprise is a secure route for the transport of material. The improvements in steam navigation have entirely changed the tactics of naval warfare. We have seen

(and we have lately felt) the destructive effects caused by one cruiser—the “Alabama”—upon the commerce of the enemy. But, at the same time, we know that the maximum power of the enemy at sea will depend on their supply of coal. Our two great allies, coal and iron, are beneath our feet. Thus England, having command of an unlimited supply of fuel, should be able to protect a certain commercial line of transport. This protection must depend upon the natural geographical facilities afforded by the route. We accordingly find that the Mediterranean would offer peculiar advantages that would ensure a line of impregnable coal stations, and thus secure our cruisers and convoys in the event of war. In the event of a war with England, the exportation of coal would be at once prohibited. The coal stations, whether belonging to ourselves or to the enemy, would be the first points of attack. The cruising powers of a fleet or single vessel would depend entirely on their coal-carrying capacity, and their distance from a station at which they could replenish their supply. Vessels at a distance from a coaling station, if reduced to deficiency of fuel, would be at the mercy of weaker vessels well provided with coal. It therefore becomes of paramount importance that a great maritime power should, if possible, monopolise the coaling fortresses of the world. A coal station will be worse than useless unless it be a powerfully fortified position. If we examine the map, we shall discover that England is more happily situated than any other country in regard to her line of harbours and fortresses, which would become invaluable coal depôts, and ensure the safety of our vessels in the event of war. The maximum distance between the coaling stations should not exceed five days’ steaming. We have Gibraltar and Malta on the road to Egypt. We were foolish enough to abandon Corfu, which would, if in our hands as a coal depôt, protect the Adriatic. Passing from Suez down the

Red Sea, we arrive at the powerful station of Aden, thence to Bombay, Point de Galle, the harbour of Trincomalee in Ceylon, Port Louis in the island of Mauritius, Calcutta, and our various Indian ports. We therefore find that we have an admirable line of stations, which as coal depôts would furnish our fleets and assure our safe transport from the East, while we are entirely unprotected on the west, between England and America. Thus, on one side we have a monopoly of the route, while on the other we should be exposed to the attacks of the enemy.

Common sense suggests that we should encourage the development of those cotton-producing countries which are situated on the secure line of transport. India produces quantity but of inferior quality. In Ceylon, cotton has been entirely neglected, but both India and Ceylon are countries that are scarcely yet developed. The famine that has now smitten India is a melancholy reflection on the neglect of artificial irrigation. In all tropical climates, this should stand first in the list of necessary public works. Although we have been masters of that important Empire for many years, we have sadly neglected the resources that would be awakened by artificial irrigation. Eight years passed in the colony of Ceylon showed me the magnificent vestiges of past greatness—the succession of vast artificial lakes constructed by the ancients; the huge dams of chiselled stone which shut in valleys, to receive rivers that would form reservoirs during the dry season. I have wandered among the ruins of ancient cities that covered a greater area than our modern London. In those remote ages, an enormous population was self-supporting. The country was irrigated, and the result was an abundance of rice. Ceylon, with its present small population, is now suffering from the famine prices caused by the scarcity in India. I believe I was the first person to suggest, twenty years ago, in a work, entitled *Eight Years'*

Wanderings in Ceylon, that the tanks, or artificial lakes, should be renewed, and that the country should be subjected to a system of irrigation. This was subsequently commenced in some provinces by that intelligent governor, Sir Henry Ward, with eminent success. The improvements that have been effected in Ceylon within the last twenty years are but an example of the intelligence and energy of English colonists. Vast tracts of country, that I remember as wild and almost impenetrable forest, are now changed into extensive districts of coffee cultivation. Upon the high mountain ranges, where the temperature is too low for coffee, plantations of tea and the cinchona plant have been commenced; and there can be little doubt that as coffee has replaced the wild forests up to certain altitudes, so also will tea and the cinchona eventually usurp the rank jungle of the higher mountains. These great results are the reward of original explorations. The explorers may be forgotten, but these are their fruits.

We will now turn our attention to the resources of Egypt, especially as a cotton-producing country. As our colonies that were originally wilderness have become prosperous through the energy of the colonists, so will Egypt become of the first importance if her natural capabilities be developed. The assumed and generally accepted fertile portion of Egypt is the delta caused by the deposit of the Nile. Although this is of limited area, it was in ancient days the granary of Southern Europe. We well remember the Biblical account of the seven years of famine when Joseph administered the affairs of Egypt, and he bought up all the corn to store in magazines for the approaching scarcity. We vainly wish that Joseph were Governor-General of India at the present moment. He would hardly have sanctioned the exportation of rice in the face of famine. Egypt was in those early days a great agricultural country,

and was not only celebrated for the productions of its soil, but for the extremely fine texture of its manufactures, especially linen. Notwithstanding our improvements in machinery and in mechanical contrivances, we cannot produce a thread so finely spun as the old flaxen thread of Egypt. The periodical inundation of the Nile rendered the cultivation of the delta extremely simple; and hardly any change has taken place in the method of tilling, or even in the shape of the agricultural implements, to the present day. The great change is in the character of the productions; cotton and sugar have usurped the place of the ancient cultivation of flax. The area of the delta is extremely limited, and, during the scarcity of cotton caused by the American civil war, the extreme profit of cotton cultivation induced the fellaheen, or farmers, to plant as much as they could gather. This cotton mania exceeded the natural resources of the delta, as the excess of cotton told upon the superficial area to the detriment of the supply of food; thus, while cotton was exported, it became necessary to import wheat, which had hitherto been the staple export of the country. We can thus prove the maximum capability of the delta as a cotton-producer. The delta and the sandy deserts are all that strike the attention of the ordinary traveller, who cannot believe that, beyond those inhospitable and apparently boundless sands, there are countries of vast extent and of unbounded fertility. In north latitude 17 deg., we enter that Ethiopia in which were indigenous those "wool-bearing trees" described by the great historian. We find a country of wonderful fertility south of the great Nubian desert. This country extends to the base of the mountains of Abyssinia, and is watered by the rivers Atbara, Blue Nile, Settite, Rahad, and Dinder. The rains commence in June, and continue regularly till the middle of September. The land is generally level, the soil deep loam and free from stones,

and is especially adapted for the cultivation of cotton. The certainty of dry weather for the harvest is an inestimable advantage. There is a large Arab population, but at present the means of transport are confined to camels. The exit for the produce would be *via* the port of Sonakim, north latitude 19 deg., on the Red Sea, with the advantage of the Suez Canal. It is impossible to fix a limit to the cotton-producing power of this extraordinary country. The various rivers, already named, render facilities for irrigation throughout immense districts. Leaving Khartoum, 15 deg. 30 min., we now commence the voyage of the White Nile. Nothing can exceed the richness of the islands, which are composed of a nearly black soil, the result of a vegetable decay, and of mud deposited by the river. For some hundred miles the banks are covered with forests of the *Acacia Arabica*; these trees afford the only timber that is adapted for shipbuilding in those climates. The wood is extremely hard, and can only be worked with ease while green, but it is durable, and sufficiently strong to resist the shocks of collisions, which are constantly occurring between the clumsily-navigated vessels. There is no wood equal to the *Acacia Arabica* as fuel, which, for the furnaces of steamers, is nearly as good as coal. The supply of this valuable material on the banks of the White Nile is inexhaustible. Thus every facility exists for steam navigation. The width of this grand river above the Khartoum junction is more than two miles; the current is rather slack, and the steamers have no difficulty in travelling night and day, at an average of seven knots an hour against the stream.

The first negro tribe that is met with is the Shillook. This is a most important country, and numbers upwards of a million inhabitants. The Shillooks are a fine, industrious race of people. The cotton plant is indigenous to their country, and it is to this spot that I wish to draw particular

attention. About ten years ago, the Egyptian Government formed a settlement, during the administration of Said Pacha, the uncle of the present Khedive. This station grew into a town of considerable importance, and it was supposed to act as a check upon the slave trade. After the death of Said Pacha, the governors of the country relapsed quickly into the old habit of slave dealing, and Fashoda, the new settlement, became a military position, from which raids were made over the adjacent country. Enormous herds of cattle were carried off, and driven in thousands to Khartoum ; slaves were kidnapped ; the Dinka country on the opposite bank was actually depopulated, and ruin menaced the industrial Shillooks. It was at this critical time that I arrived in the country, and caught the Governor in the act of kidnapping the women and children. These I released, and at once established confidence among the Shillooks. The slave-hunting Governor was disgraced. I introduced the seeds of the finest quality of cotton, that I had brought from Egypt in considerable quantities, and I encouraged the Shillooks to commence cotton cultivation, and to exchange the raw material for manufactured goods. This commencement is already producing satisfactory results. Merchants have now established themselves at Fashoda, and trade has been carried on with the Shillooks with considerable success. Not only Manchester goods, but even money, is now accepted in return for raw cotton. If this country should be honestly governed, it will at some future time become most important. The river frontage of the Shillook extends for about two hundred miles. The Nile is deep at all seasons of the year ; and this magnificent river, for a distance of seven hundred miles, from the southern limit of the Shillook country to Khartoum, is not only navigable for large vessels, but is eminently adapted for steam navigation, owing to the natural supply of fuel already mentioned, which can be procured for the simple labour of hewing the wood.

It is most important to England that the cotton resources of Egypt should be developed, but, notwithstanding the great natural capabilities of the country, I cannot hope for success under the present administration. The Mahommedans are not progressive. There is no country that is governed and occupied by this fanatical people that exhibits a healthy appearance. The Mahommedan is a backslider. The finances of Mahommedan states are unsound; and what can we expect of the future, when we know that the present is even worse than the past? The development of a new country depends mainly upon the personal qualifications of the governor. We have seen many instances in our own colonies of fluctuating prosperity depending upon the man at the head of the State. In a country where the native population is savage a good governor has the most extraordinary influence, and the first step necessary to success is to establish the most thorough confidence. The protection of the natives from injustice, and a complete security against the slave trade, will apparently win the affections of the people. Egyptian officials do not appear to understand the meaning of injustice; neither have they sufficient discrimination to perceive that by a connivance at the slave trade they are impoverishing their country, by decreasing the population. From the experience I have had, I believe that three lives are sacrificed for every slave that is safely brought down to the coasts of the Mediterranean or the Red Sea. The kidnapping of slaves induces a series of murders. The system adopted is as follows: There are about fifteen thousand Arab subjects of the Khedive who have quitted the Soudan, and are engaged in a life of brigandage upon the countries east and west of the White Nile. These men are armed with muskets, and are subjected to a rough military organisation. The so-called ivory merchants of Khartoum are their employers. Some of these traders have as many as

two thousand five hundred of these brigands in their service, generally divided into parties of three hundred each, under the separate command of a vakeel, or agent. They occupy a line of stations at intervals of a day or two's march; thus they hold military possession of the country in which they may settle. From the stations they make raids upon adjacent countries, in company with the negroes of their immediate neighbourhood, and plunder, burn, and destroy. To attack an unsuspecting town, they march throughout the night, and arrive about an hour before daybreak. Volleys of musketry are poured through the straw huts among the sleeping inmates, and in the confusion of the conflagration the people, thus roughly awakened from sleep, are shot down without serious resistance. The women and children, screaming and scared, fall an easy prey to the slavers. Very old women, who are considered worthless, are quickly knocked on the head. Young infants are put out of their misery, simply by dashing their heads against the ground, the child being held by the ankles and used as a club. The slaves thus caught are tied by the neck and formed into a living chain. These are now driven to camp. Should any women or children be met with during the journey, they are seized and added to the captives. The cattle are, of course, seized by thousands. This system of kidnapping is carried on from year to year; thus flourishing countries have been rendered desolate, and the women and children in multitudes have been carried into captivity. At a certain season, the annual vessels arrive from Khartoum. Upon these boats, which average about fifty tons, the slaves are closely packed, and the voyage commences down the White Nile. About three hundred slaves are crammed upon each vessel. The stench is insupportable. The victims of this cruelty are frequently attacked by severe epidemics, such as smallpox or typhus, during the voyage. Those who are dangerously ill

are thrown overboard without mercy. Frequently more than half the cargo perishes when smallpox attacks the vessels. The slaves delivered in the Soudan from the Upper Nile are sold to dealers, who conduct them to all portions of the slave-holding world. The tedious journeys across the deserts generally kill those who are enfeebled by the sickness and privations of the White Nile voyage. I have entirely stopped this horrible traffic of the river, and also in the provinces under my command; but there is no disguising the fact that immense numbers of slaves are passed down the country far to the west of the White Nile. These are passed through the country of Darfur, and are divided into gangs to be sold to the Arab dealers.

The annual loss of human material entailed by the constant massacres, and by the multitudes of women and children that are carried off as slaves, is sufficient to paralyse Central Africa. I have seen whole countries rendered desolate. If those countries were worthless, we might hardly sympathise with the fact of depopulation; but they are lands not only of extreme fertility, but with a healthy climate, where, under a careful administration, the population, assured of protection, would become industrious, and would quickly develop the agricultural resources of the soil. In some of those countries of equatorial Africa, we find the sugar cane and the coffee plant growing without cultivation. There are boundless tracts, situated at a mean altitude of about 3,500 or 4,000 feet above the sea level, with a fertile soil, healthy climate, regular rainy season, and a docile population that are eminently adapted for coffee cultivation.

There are other positions suitable for the sugar cane; there are lowlands bordering the river, adapted for rice. European vegetables would thrive on the higher levels; and I am convinced that the introduction of sugar, cotton, rice,

spices, and hemp and flax would be followed by great results, precisely as the success of our Colonial agriculture is the result of the importation and acclimatisation of foreign produce.

Thus, at the same time that we find these beautiful and fertile countries in the heart of Africa, we also find that instead of developing the resources of the country, the Egyptian authorities have connived at the destruction and ruin of the population. I have now established a reform in the equatorial Nile Basin. The slave hunters are driven out; the government is firmly established; and the natives are cheerfully paying a corn-tax for the support of the troops. Legitimate trade was introduced, and the natives exchanged ivory (in the Unyoro country) for Manchester goods, hardware, beads, brass, etc., leaving a minimum profit of 1,500 per cent. to the Government. I launched a steel steamer of 108 tons in north latitude 4 deg. 54 min. Another steel steamer lies ready packed in sections at the same spot, to be conveyed to the Albert N'yanza. A third steamer of 250 tons was carried in sections, together with the above vessels, with immense labour, across the desert to Khartoum. This is to be conveyed to the Albert N'yanza whenever the necessary camels shall be sent from the Soudan. The foundations are laid for a great future. When steamers shall navigate that great inland sea, the Albert N'yanza, depôts or trading stations will be found at convenient intervals on the border of the lake. Each depôt will form the nucleus for the trade of its vicinity. The present natural productions are ivory, skins, and valuable fibres. These will be increased by the introduction of coffee, spices, etc. Thus will Central Africa receive the first seeds of civilisation.

The first grand reform has been made, by the suppression of the slave trade; thus the human material hitherto wasted and drained from the country will be preserved, and will, by

good government, be applied and encouraged to the agricultural development of their soil. Already there exists in Central Africa a terrestrial Paradise. Mountains, undulations, plateaux, terraces, plains beautifully timbered and intersected with innumerable perennial streams of pure water, form a picture that is incredible to the thirsty traveller who is vainly passing through the scorching and sterile Nubian desert. The question arises, By whom will the civilisation of Africa be effected? Is there the slightest hope that such a result can be expected at the hands of a Mahomedan power? The Mahomedans will assuredly return to the slave trade, in spite of the Khedive's orders to the contrary, should English influence be withdrawn. I believe that the Khedive must be sincere personally, but it is difficult to persuade strangers of this fact. At the same time, I am convinced that the civilisation of Africa will not be effected by the simple preaching, either of the missionary or of the Foreign Office. The development of the resources of that magnificent country will depend entirely upon commerce; commerce will depend as entirely upon the character of the government; and all and everything will depend upon the total eradication of the slave trade. If England will sternly use her influence, by speaking in a tone of unmistakable decision upon this subject, the Oriental governments must suppress the slave trade; but if we are in that state of political nervousness and feebleness that we can only interfere by soft suggestions, it would be wiser, and would spare us from derision, if we were to abandon the subject of slavery, and cease to meddle in the domestic affairs of the East. In that case, Central Africa will once more become a hunting ground for helpless women and children, and evil instead of good will be the result of annexation to Egypt. There is one road to steady improvement, and only one, throughout Egypt. The Khedive is

a man of high intelligence, and he wishes sincerely to benefit his country. This can be done by the appointment of Europeans as governors of his provinces, to replace those locusts, in the shape of Egyptian officials, who live by the oppression and spoliation of the peasantry.

I commenced this lecture with the theory, that the original explorer and discoverer of new lands lays the foundation for future commercial welfare. I had the honour, in my first exploration many years ago, to be the discoverer of the great lake, Albert N'yanza. In this, my last expedition, I have had the satisfaction of giving freedom to those who were oppressed, and I have driven the oppressors from the country. I established a simple, but just and paternal government. Already a steel steamer is launched upon the Upper Nile, the precursor of those which will assuredly at some future time open the heart of Africa to commercial enterprise, as the grand result of original exploration. My reward in Egypt, for years of hardship and anxiety, coupled with no small personal exposure, has been the general hatred of all Mahommedans who are slaveholders. In England, my reward is the general appreciation of my endeavours by my own countrymen, the spirit of whom I trust I may have represented by an unflinching determination to stamp out at all hazards the abomination of the slave trade. I have, lastly, a further reward and gratification at the close of my labour as the commander of the Khedive's late expedition, that the name of England is now made known to the natives of Central Africa as one that will support the oppressed, and deliver the slave from "the house of bondage."



THE GREAT EUROPEAN SALT DEPOSITS; WITH A THEORY AS TO THEIR ORIGIN.

By THOMAS WARD.

SALT is met with either as a deposit in the shape of rock salt, or as a solution in the form of brine springs, sea water, the water of salt lakes and lagoons. The brine springs may be classed with the rock salt deposits, as in almost every case they derive their origin from them.

The great salt districts of Europe, those in which rock salt or brine springs are met with, are :—

1. The District of the Carpathian Mountains.
2. " " Austrian and Bavarian Alps.
3. " " of Western Germany.
4. " " of the Vosges.
5. " " Jura.
6. " " Swiss Alps.
7. " " Pyrenees.
8. " " Spanish or Celtiberian Mountains.
9. " " of Cheshire and Worcestershire.
10. Isolated deposits and brine springs in Russia, Turkey, Italy, Prussia, British Islands, etc.

1. *The District of the Carpathian Mountains.*—This is the most extensive and rich salt district in Europe. It possesses salt enough to supply the whole of Europe for several thousand years. The Romans mined salt in various parts of Transylvania, and down to the present time salt has not ceased to be obtained from that country. Posepny carries it further back, for he says that from the oldest stone

period to the present time the Transylvanian rock salt has been mined. ("So dass sich der Siebenbürgische Salzbergbau aus der ältesten Steinzeit ununterbrochen bis zur Gegenwart verfolgen lässt."—*Jahrbuch der K. K. Geologischen Reichsanstalt*, xxi Band, No. 1, 180.) From the extreme west of Galicia, following the direction of the mountains to where the Carpathians meet the Danube at the famous Iron Gate, salt is more or less widely distributed on both slopes of the chain. The district may be divided into the Moldo-Wallachian, the Transylvanian, the Gallician, and the Hungarian sections.

The salt mines of Wallachia are very noted, and the salt is distributed by means of the Danube and its tributaries over Bulgaria, Servia and Hungary, as well as over the home districts. The salt used is the rock salt, as is generally the case throughout the district of the Carpathians. Owing to the absence of cheap fuel, and the tolerable purity of the rock salt, very few attempts to manufacture white salt have been made, and millions of gallons of nearly saturated brine are allowed to run to waste. The mines at Stanikul, Kimpina, Okna and Okna Mare are the most important in Moldo-Wallachia.

Transylvania, or, as the Germans call it, Siebenbürgen, is richer in rock salt than any other portion of Europe. It consists of a central basin, that of the Maros river, and the basins of the upper courses of the Szamos and Alt rivers. The whole territory is more or less mountainous, and the deposits of rock salt are frequently found along the banks of the small rivers amongst the hills. The supply of salt is inexhaustible. It is only slightly worked in most parts, owing to the want of communication of a cheap kind. The great centres of salt mining are Maros Ujvar, on the Maros river, most favourably situated for water communication, and hence the largest shipping town in the district, exporting

seventy per cent. of the Transylvanian salt; Parajd, on the Korond, a tributary of the Maros; Dées Akna, on the Great Szamos; Szamos Ujvar, on the Little Szamos; and Vizakna, on a small tributary of the Maros. The mine at the small town of Sasmezo, in the Ojtoszer Pass, forms a connecting link between the Transylvanian and Moldo-Wallachian districts. Two remarkably full and interesting Papers on the Transylvanian salt districts were published by F. Posepny, in the Vienna *Geological Jahrbuch*, 1867 and 1871. ("Studien aus dem Salinengebiet Siebenbürgens," Von F. Posepny. *Jahrbuch der Kaiserlich Königlichen Geologischen Reichsanstalt*, Wien, xvii Band, 1867, No. 4; xxi Band, 1871, No. 1.) The generality of the mines lie near the surface, though the salt is followed downwards to great depths. The quantity of salt mined is very small compared with that in English mines. The whole annual production of Transylvania is estimated at fifty thousand tons, about one-eighth of the production of all kinds of the Austro-Hungarian empire. In England the production of rock salt is about a hundred and thirty thousand tons annually. It must, however, be borne in mind that the rock salt is mined much more carefully than in England, and only large blocks or lumps are used.

The Gallician district extends along the north and north-east slopes of the Carpathians, from Moldavia to Moravia. There are numerous mines and brine springs scattered at intervals along this district. The most celebrated salt mines in the world, and those longest worked, are the mines of Wielicza and Bochnia, at the extreme west of Gallicia. The mines at Wielicza are well known from the frequent descriptions of them given; they have been worked since the thirteenth century. The mines and works of Sanok, Starasol, Kaluscz, and numerous other places, send out considerable quantities of salt; and recently there has been

discovered in the Kaluscz mine sylvin, or native potassic chloride, and kainit, or potassic chloride and magnesian sulphate. These salts are extremely valuable, and when speaking of Stassfurt, in the West German district, it will be necessary to mention them again.

The Hungarian salt district is very extensive, but almost wholly confined to the region of the Carpathians, from the borders of Transylvania to Moravia. One of the largest districts lies in the basin of the Szamos, in the neighbourhoods of Szathmar and Szigeth, and in the neighbouring districts of Marmaros. In the districts of Soovar and Szlec, in the extreme north of Hungary, there are numerous mines.

We have now traced a continuous series of salt deposits from the neighbourhood of the Alt in Wallachia, along the Carpathians (and the minor chains running from them) around Transylvania, and thence on both slopes of the same mountains between Galicia and Hungary, until the Sudetic mountains are reached.

2. *The District of the Austrian and Bavarian Alps.*—

This is probably the best known salt district of Europe to ordinary travellers, being frequently visited for its beautiful scenery. The most important mines and springs lie in a comparatively small district, in the upper parts of the basins of the Traun and Salza, and partially in the basin of the Inn. The most celebrated district is called the Salzkammergut. It lies on both sides of the river Traun, on the borders of Styria and Salzburg. The salt is chiefly manufactured. In many cases water is allowed to run into the rock salt mines, and to become saturated brine, then drained off, and manufactured, frequently many miles away. The district extends into Bavaria, along the valley of the Salza. The most important salt towns in the Austrian portion are

Aussee, Ischl, Hallstätt, Hallein. The Bavarian portion is very rich in salt, the chief towns being Berchtesgaden Reichenhall, Traunstein, and Rosenheim. The latter town manufactures the salt from brine conveyed in pipes from Reichenhall. This alpine district extends into the Tyrol, as at Hall, near Innsbruck, in the Inn Valley, are very extensive salt deposits and salt works, and the rocks are similar in character to those of the Salza and Traun.

8. *The District of Western Germany.*—Under this head I have classed a very large number of salt mines and brine springs, extending from Segeberg in Holstein, in the north, to Sulz on the Neckar in Wurtemberg, on the south, and from Kreuznach on the Nahe, on the west, to Halle near Madgeburg, on the east. As these numerous salt deposits and brine springs are by no means equally spread over the district, it will be well to group them as much as possible. The first group lies in the valley of the Neckar, and one of its chief tributaries, the Kocher. The Black Forest mountains form the west boundary, and the Suabian Jura the east. The chief towns are Sulz, Wilhelmsglück, Hall, Wimpfen, Neckar-Sulm, and Sulzbach. In the valley of the Main and its tributaries are a few brine springs. At Hallstadt a large quantity of salt is made; at Kissingen is a very strong brine spring, and salt is manufactured at Nidda.

The District between the Elbe and Weser contains very large quantities of salt, and springs of brine are met with in great numbers, from the banks of the Werra and Saale to those of the Aller. The most numerous springs, as also the rock salt deposits, lie near the various small ranges of mountains that are scattered about the district, as the Thuringer Wald, Harz Mountains, Teutoberger Wald, etc. The most important towns are Salzungen, Allendorf, Halle, Stassfurt, Salza, Schönebeck, Harzburg, Neustadt, Salzgitter, Salzder-

helden, Salzwedel, Hildesheim, Rodenberg, Sulze, Luneberg, etc. Closely connected with this district is the *Ruhr Valley in Westphalia*, in the neighbourhood of Unna, where are numerous brine springs. Two localities of special importance are, the district between Magdeburg and Halle, more especially in the neighbourhood of Stassfurt; and the Luneberg Heath in Hanover, to the south of Hamburg. In both localities brine springs have long been known, and Schönebeck and Luneberg have been centres of salt manufacture for a considerable period. It is only in late years that the extensive deposits of rock salt in both neighbourhoods have been discovered. There is at this moment no town connected with salt in the world that has so rapidly risen, and has so great a future before it, as Stassfurt and its immediate neighbour Leopoldshall. It was not till 1857 that the rock salt was worked, and later still the potash salts, that now occupy more workmen than the rock salt. The following statistics show the rapid growth of the latter trade. In 1861, about 2,362 tons of potash salts were mined; in 1869, 109,075. The quantity is still increasing, and new mines are being sunk.

There is one more small district lying quite outside the others, that of Oldesloe and Segeberg, in south Holstein. At Oldesloe a brine spring has been worked for a very long period. It is only within the last few years that rock salt has been discovered at Segeberg, and already the Germans anticipate underselling our English salt all round the Baltic Sea.

4. *The District of the Vosges.*—This is a very important district. Its salt meets English salt very extensively in Belgium. A great portion of east, north, and central France is supplied from it. Until the late Franco-German war the district belonged wholly to France, but, lying in the

ceded district of Alsace-Lorraine (principally in Lorraine), now belongs to Germany, thus rendering Germany the possessor of some of the most extensive salt deposits in Europe. Austria and Germany together possess more salt than all the rest of Europe. The chief towns in the Vosges district lie in the neighbourhood of Metz and Nancy, and are Chateau Salins, Dieuze, Moyen Vic, Sarrealbe, Salzbron, Rosière. The salt is chiefly manufactured from brine springs, though a considerable quantity of rock salt is mined at Vic.

5. *The District of the Jura.*—Since France has lost the salt district of the Vosges, the long-noted one of the Jura will become of more importance. It is separated from the district just mentioned by the Plateau of Langres, and lies in the basin of the Saone and Doubs. The salt springs of Salins have been noted from remote antiquity. The chief centres of manufacture are Salins, Arc, Lons le Saulnier; Montmorot, Saulnot.

6. *The District of the Swiss Alps.*—This small district lies on the right bank of the Rhone, just before the river enters into the Lake of Geneva, in the Canton de Vaud. It has celebrated rock salt mines and brine springs. The chief centres are Aigle, Bex, and Roche. Rock salt was mined here three hundred years ago.

7. *The District of the Pyrenees.*—Like the Carpathians, the Pyrenees are rich in rock salt deposits and brine springs. In the western district of the Pyrenees, in both France and Spain, salt appears to be most plentiful. In France, the basin of the Adour is the most important district, and contains the towns of St. Michel, Camou Soule, Salies de Béarn, Pandelon, and Dax. The rock salt at the

latter town was discovered accidentally, about three years ago. At Salies d'Arbas, on the Garonne, near the Pyrenees, a brine spring exists, and salt is manufactured. In Spain, we find the whole basin of the Ebro rich in salt, especially towards the source of the river, as is indicated by a number of villages, whose names contain either Sal or Salinas. In one small district we find Salinas, Salinas d' Amana, Salinillas, Poza de la Sal. On the banks of the Ebro are Mendavia, Valtierra, Remolinos, and Sastag. Both rock salt and brine springs are plentiful. One of the most peculiar deposits of rock salt known to exist is in this district, about forty-five miles to the north-west of Barcelona, on the banks of the Cardoner river. I refer to the famous rock salt mountain of Cardona. This is a hill composed entirely of rock salt, which is quarried in open quarries like stone. It has been so frequently described as to render it unnecessary to further refer to it.

8. *The Celtiberian or Spanish District.*—It is scarcely fair to call this a salt district, it is rather a number of isolated mines and brine springs; but as the Spanish mountains form one connected system, known as the Celtiberian, and as the salt deposits seem to be generally connected with the mountains, I thought it best to classify them thus. The chief towns are, Saelicas, in the province of Guadalajara; Torreximeno, in the province of Jaen; Villafafila, in the province of Zamora; Monteagudo and Minglanilla, in the province of Cuença; Cazorla and Hinojares, in Andalusia; and Jumilla, in the province of Chinchilla. There are indications of salt in various other places; indeed, Spain seems richly endowed with this mineral.

9. *The District of Cheshire and Worcestershire.*—This well known district calls for but few words from me, having

dealt with it so recently in a previous Paper. The chief centres of rock salt and brine springs are, Northwich, Middlewich, Winsford, Sandbach, in Cheshire; Weston-on-Trent, in Staffordshire; Stoke Prior, and Droitwich, in Worcestershire.

10. *Isolated Salt Deposits and Brine Springs.* — Under this head I wish to enumerate the most important places in which salt exists, but which seem to be unconnected with any extensive deposits. In our own country, at Carrickfergus, near Belfast, there is an important rock salt deposit. At Middlesborough-on-Tees another valuable deposit of rock salt exists. At Chester-le-Street, in Durham, is a brine spring. Indications of salt are to be met with in Staffordshire, Shropshire, and Lincolnshire. In France, at the foot of the Alps, at Moutiers and Castellane, are well-known brine springs from which salt is made. These may possibly belong to the same district as those of Aigle and Bex. In Italy, at Volterra in Tuscany, salt is manufactured; and at Lungro and Altamonte, in the mountains of Calabria, rock salt is mined. In Sicily, at Nicosia and Mussomeli, are salt deposits. At Szamobor, in Croatia, and Tuzla, in Bosnia, salt is found. In Russia, at Bachmutz, on the Donetz; Balachna, on the Volga; Staraia Russa, near Lake Ilmen; Solikamsk, on the Kama, and the neighbourhood to the Ural Mountains; and at Iletzkaya, salt deposits exist; also at Eupatoria, in the Crimea, rock salt is found. In Prussia, at Jnowraclaw, Rawicz, Waltersdorf, brine springs are found; and at Sperenberg, to the south of Berlin, a bed of rock salt, of the enormous thickness of 2,810 feet, had been bored into in 1870, according to Quenstedt, in *Klar and Wahr*, p. 252.* At Kreuznach, on the Nahe, rock salt is mined; this town seems connected with the Vosges district.

* "Im Oktober, 1869, stand das 2270' tiefe Bohrloch von Sperenberg bereits 1920' (Iais 1869-188) im Mai, 1870, sogar 3090' tief und 2810' im Salz!"

Having now laid before you the European salt deposits, I wish to call your attention to what I consider to be their origin. It will probably have struck you, as this Paper has progressed, that most of the salt districts are intimately connected with mountains. Bearing this in mind, and at the same time remembering the great peculiarity of rock salt, that it does not form widely extended deposits, but almost invariably appears in isolated basins or troughs, often of considerable depth, but rarely of any great width or length, it would seem that the best representative of what the land must have been, when much of the salt was deposited, would be a mountainous island, something like what Switzerland and its adjacent territories would make if surrounded by the sea,—a number of lakes, of various sizes, in the valleys and neighbouring lowlands. The theory I have respecting the salt deposits is, that they owe their origin entirely to the elevation of the mountain chains with which they are so intimately connected. Whether these chains of hills have been pushed up by the action of internal heat, or are the result of the shrinking and contraction of the crust of the earth, owing to its gradual cooling, I need not discuss; whatever be the cause, nothing is more certain than that the mountain ranges have been elevated from a once level, or nearly level, position beneath the waters of the seas. As the earth is now, so probably it always has been since it first arose above the waters. Hill and dale, plain and plateau were common in the primary and secondary periods, as now. The bed of the ocean then, as now, was full of irregularities. Let us endeavour to see what would be the result of a gradual long continued elevation of an extensive portion of the sea bottom. The line of greatest applied force, or least resistance, according to the theory of elevation chosen, would rise the most rapidly, and from that line long slopes would reach on either side. The rising would not be

equal through the whole length, but more in one place than another. Irregularities of all kinds would arise as the elevation continued. Soon land would begin to appear, as a shoal or reef, then as an island, and shortly as a group of islands. As the centuries rolled on, more and more land would appear, and islands would be grouped and form larger islands, the former straits and bays now being valleys, and the sea bottom plains and plateaus. The process being slow, and the elevation unequal in places, here and there small valleys and ravines would be cut off from connection with the sea by ridges of land, and would form salt lakes and lagoons. It would be many years before the total separation would be complete, and high tides would still flow over the ridge into the inland lake or lagoon. As the surface of land above the water would not for many ages be very extensive, there would be no large drainage of fresh water into the salt lakes, so that evaporation would take place, and salt be deposited year by year, salt water being added at high tides and replenishing the lakes, daily becoming more saturated. The small trickling rills and tiny watercourses that furrowed the newly risen land, but scantily clothed as yet with vegetation, would carry into the lake the earthy matter brought down by them, which would settle as clay, and permeate the underlying salt. As time progressed the lake would become more saturated, and deposit its salt more rapidly, the sea would be entirely cut off, the surface of the land would become more extensive, and the fresh water more plentiful. In the dry season the lake would become one mass of salt, which would soon be covered by the earthy matter from the neighbouring slopes, and ere long the basin would become filled with salt and mud; the various tiny streams would form rivulets, and the land extend on every side. Still, as the land rose and the sea receded, would be left in favourable spots salt lakes; but as the surface of the dry land increased,

so would the fresh water, falling upon it in the shape of rain, increase, and this, naturally running to the lowest level, would find its way into some of the salt lakes and freshen them, and, filling them, force a passage through, and form in time fresh water lakes. Thus we see that the chances of a salt lake depositing its salt would be much greater in the neighbourhood of the mountains than at a considerable distance from them. So far, the facts agree well with the theory. It will be necessary, however, to imagine a period of subsidence, and the sea covering the land, and again another rise. In fact, it would seem that a kind of oscillating motion is continually but slowly going on. Alternate elevation and subsidence are taught by all the geological facts presented to us. Having put forward this theory, I will examine if there is anything at all resembling it now going on.

I am not able to point out any district in which a state of affairs similar to that which existed when the salt deposits amongst and near to the mountains took place. It would almost seem as if the great age of salt deposits was that of the New Red Sandstone or Triassic period. The peculiar character of the country bordering the Caspian Sea, round the lower courses of the Volga and Ural, points to a period in the history of the salt now being deposited, analogous to that in the old deposits, when the surface of land which had become elevated was very extensive, and the sea shores were all very low and fringed with lagoons ; the time when some of the isolated deposits of rock salt away from the mountains were deposited. I could almost believe that this Caspian district is but the continuation of the process begun so far back as the period of the Trias. It is a well known geological fact, that at the time the rock salt was being deposited in the district of the Carpathians and the Permian district, on the west slope of the Urals, the whole

of European Russia, with few exceptions, was under water. Whether the theory that the Permian rocks were deposited in salt lakes* is correct, I cannot say; but if so, it would corroborate my theory, for, in the district of Perm, noted for these rocks, we have the finest beds of rock salt and brine springs in Russia,—those at Solikamsk. Coming southwards, from Perm towards the Caspian, we meet with the rock salt deposit of Iletzkaya; and on the Steppes, in the province of Orenburg, rock salt is found in abundance, and so situated as to suggest that few changes have taken place since its deposit. The Steppes are made up of reddish sandy marl and whitish gypsum; these are the usual accompaniments of rock salt. In one place the rock salt lies at a very slight depth below the surface, in a basin about one and a third miles long by about a mile broad, very similar in size to that of Northwich. The Russians have taken off the covering of clay and gypsum, and quarried the salt in an open quarry to the depth of seventy feet. It would seem from the purity of the rock salt that very little muddy water ever drained into this salt lake. At the present day salt lakes, similar in character to what this must have been, exist all over this immense district, where, with the exception of the Volga, Ural, and a few other rivers, all the streams and lakes are saline. The famous Lake Elton, perhaps the most salty in the world, is on this Steppe, as also is Inder, which is very similar. The quantity of salt deposited by these lakes is enormous. Frequently one hundred thousand tons of salt is obtained from Elton in one year. The whole appearance of the Khirghese Steppes, between the Caspian and Aral, points to a gradual drying up of the old seas. It would seem as if the Caspian, by the

* "We are justified in concluding that the Permian rocks were deposited in great salt lakes, though perhaps not salt in every case."—Professor Ramsay *Nature*, vol. vii., p. 384.

rising of the land in all directions around, or else by the subsidence of the district in which this sea exists, had been left behind, or cut off and isolated. There lives in the sea still a species of seal, whose retreat has been thus cut off. Without dwelling longer on this Caspian district, which seems to me to illustrate clearly some phases of the deposition of rock salt, I may point out another region which gives a similar illustration. I refer to the great Desert of Sahara, and the mountains of the Atlas, in Morocco and Algiers. It is well known that the Atlas mountains are rich in rock salt from one end to the other; also that the slopes and plains, from the mountains to the middle of the Sahara, are noted for salt lakes, the very soil being impregnated with salt. It is evident that, for many ages after the Atlas mountains were elevated, and the deposits of rock salt in the small valleys and basins amongst these hills formed, the Atlantic Ocean had uninterrupted course over the present Sahara. By gradual elevation of the land the sea retreated, until it passed off the present continent, in the district where the north-west coast of Africa is very low, and is continued by sandbanks far into the present ocean.

The Great Desert of California, as it is called in North America, lying between the Rocky Mountains and the Sierra Nevadas of California, and terminated on the north by the Oregon Territory, and on the south by Mexico, forms an immense basin, much resembling the bottom of a dried up sea. This desert, like that of Sahara in portions, is noted for its salt lakes, and in many parts its soil is impregnated with salt. Beds of rock salt are found in many districts, and doubtless, when it is better known, more will be discovered. In this desert is the famous Great Salt Lake, about seventy miles long and more than thirty miles broad, with water almost fully saturated, and surrounded by salty incrustations. There are many other smaller salt

lakes,* and many parts of the district resemble portions of the Russian Steppes of the Caspian, the soil being impregnated with salt, and covered with a saline efflorescence.

I might take most of the desert regions of the world where salt lakes abound, and use them as illustrations of the ancient salt deposits. The Desert of Atacama, in South America, has its salt lakes and salty soil. In Australia, very recently, a very extensive salt lake has been discovered ; and in the most barren portions of South and West Australia are numerous small salt lakes. The same is the case in the Pampas of South America, the deserts in South Africa, and in Persia. By a careful study of the phenomena presented by these various districts, especially those more nearly resembling old sea bottoms, we cannot but be led to the conclusion that during the time the numerous European salt beds were being deposited a gradual elevation of the land was taking place, and that the surface of the land was bare and desert-like, with but scanty vegetable and animal life. This desert-like appearance of the land may account for the very slight traces of either animal or vegetable life to be found in the salt deposits. In England, I am not aware of any fossils having been found ; in Wieliczka, numerous pine nuts have been discovered, and a few branches of trees ; also in Transylvania, a few species of foraminifera.

I will now give a rapid glance at the various salt districts that I have brought before you, and examine how far they agree with my theory.

In the Carpathian district, the deposits of rock salt are almost invariably amongst the mountains, and none lie very far from hills, most being in the river, towards

* In Nevada, at the sink of the Carson river, a bed of rock salt, five miles square, evidently forming the bottom of a dried up salt lake, has been recently discovered. The salt is very pure, and only about fourteen feet thick.

the upper courses of the streams. The greater portion of the Carpathian Mountains belong to the Secondary period. There are some Primary rocks, but no salt is found in their immediate neighbourhood. In Transylvania, some of the mountains and the deposits in the river valleys are Tertiary, and the salt is found either in these or underlying them. The Secondary and Tertiary periods, here as elsewhere, seem to be the great salt periods.

In the Austro-Bavarian districts, the salt is found in the very heart of some of the mountains, and in several cases at great heights. These salt-bearing mountains and valleys all belong to the Secondary period, whilst many of the mountains in their neighbourhood are Primary.

Western Germany forms a fine specimen of a country intersected by numbers of small ranges of mountains, and divided into isolated basins. The whole district is extremely rich in salt springs and rock salt deposits. The appearance of the whole country when the mountains were rising would be that of an archipelago of islands, which in process of time became an extensive district of country, with numerous large salt lakes in isolated basins. The most numerous of the salt deposits and springs are near the hills and in the upper courses of the rivers, though a few are at a considerable distance from high hills. The mountains of this district are almost all Secondary.

The Vosges and Jura districts again show the salt deposits and springs closely connected with hills, and these of the Secondary period. The solitary deposit of Creuznach, also near the hills, belongs physically to the Vosges district.

In the Swiss Alps, the salt deposits of Aigle and Bex are amongst the mountains, and these mountains form part of the same Secondary deposits which skirt the main chain of the Alps from the Mediterranean to near the Danube, and include the deposits of Moutiers and Castellane.

In the district of the Pyrenees, a reference to the map will show the chief salt deposits to be either amongst the hills or in the valleys forming the upper courses of the rivers. The connection with the hills seems evident. The same may be said of the Spanish deposits generally. So little is yet known of the geology of the Spanish peninsula that it is difficult to get at the exact age of the deposits in which the rock salt occurs, but what is known bears out what we have hitherto seen to be the case, that the salt deposits are closely connected with mountains of the Secondary period.

The Cheshire and Worcestershire salt beds do not lie in the immediate vicinity of the hills, but rather at the foot of the slope, and form a series of isolated basins leading towards the hills, and in the Sandbach district approaching very near them. The deposits in which they occur are well known to be Secondary. The Middlesborough and Carrickfergus deposits are both in the immediate neighbourhood of hills of the Secondary formation, and lie amongst deposits of that period.

The Italian mines and springs lie principally amongst the mountains, which in their particular districts are of the Secondary formation.

Of the Russian isolated deposits I cannot say much. Hills there are very few in Russia, except on the boundaries. Of these the Urals are of Primary age, though the deposits at their western foot are Secondary, as the well known Permian deposits indicate. At Solikamsk and neighbourhood, the Urals are near, though the salt deposits are in the Secondary deposits. The rock salt deposit of Eupatoria lies in a belt of Secondary deposits which stretches across the Crimean peninsula.

The isolated deposits of Szamobor and Tuzla both lie amongst hills of the Secondary period, though not much is known of them.

Of the isolated Prussian districts of Rawicz and Inowracław, in the great plain of that country, I know but little, though at the latter place the Secondary rock, called by the Germans Zechstein Gypse, is found.

I may now be asked, How is it, if the elevation of mountains gave rise to salt deposits, there is no salt in the Scandinavian mountains, none in the Bohemian mountains, none in the Auvergne mountains, none in the Welsh, Cumberland, and Scotch mountains? I am unable to give you a reason. I can only say, all these mountains are of Primary origin, and as yet we have not found any deposits amongst the Primary rocks. There is some natural reason, undoubtedly, for this. My theory does not stipulate for any particular period.

Salt is even now being deposited in salt lakes left by land being elevated, and the Polish salt is much of it in the Tertiary formation, for Karl Ritter von Hauer says, in an article referring to the Gallician salt deposits, that "the salt-bearing layers of the Carpathian territory are without exception imbedded in the Tertiary formation of the Carpathian sandstone." ("Die salz führenden schichten des Karpathengebietes sind ausnahmslos in der Tertiärformation des Karpathensandsteins eingelagert." *Jahrbuch der K. K. Geologischen Reichsanstalt*, 1869, xix Band, No. 1, p. 75.) Posepny also speaks of the salt deposits of Transylvania being of different ages, some what he calls of Old Tertiary (Alt Tertiär) age, others of Young or New Tertiary (Jungtertiär). This is only what we might expect, for the Carpathian Mountains being of the Secondary period, and the interior basins of Transylvania and the plains of Hungary and the Lower Danube of Tertiary formation, it is evident that the salt, lying as it does on one and under the other, must have been deposited between the two periods, or partly in one, partly in the other, or even entirely in the

Tertiary, if that period commenced with the first deposits on the Carpathian slopes. It will be better, perhaps, to fix the Secondary period as the starting point, and that and the Tertiary as great salt periods.

To make this Paper more complete as regards the salt production of Europe, I will point out the most important districts where white salt is made by the heat of the sun, either under the superintendence of man or naturally.

I will first refer to natural salt lakes. Europe does not possess many of these, and it is fortunate for her that it is so. The existence of salt lakes seems almost inseparably connected with sterile sandy deserts. As in the majority of cases, if not in all, these lakes have no outlet, they have suggested to the minds of many that they are part of the bottom of dried-up seas. The nature of the surrounding country seems to bear this theory out. If it be so, these lakes, supposing them not interfered with by man, would in time become masses of salt. The only district in Europe that possesses the character above mentioned is that lying between the Sea of Azof and the Caspian. Physically, it forms part of the great sterile district of Turkestan and Central Asia. There are numerous lakes with unpronounceable names lying about the lower courses of the Volga and Ural rivers; also salt swamps. Two lakes well known are Elton and Inder, which have been mentioned.

Besides the Caspian district of Russia, the Crimea contains numerous salt lakes, some of which bear evident marks of having communicated with the Black Sea at one period. The Crimea has been a great salt treasure to Russia, which, except in the districts now being described, possesses very little salt. The Crimea produces, chiefly from its salt lakes, above 200,000 tons of salt annually, which is very widely dispersed. With the exception of the salt lakes in the

Russian Steppes and the Crimea, there are no other salt-producing salt lakes that are unconnected with the sea, though in Hungary and Spain there are several lakes of a saline character.

One of the largest sources of salt is the sea which bathes the shores of so many European countries. From the Straits of Dover to the Dardanelles, wherever the shore is favourable, there salt is made by solar heat. I have marked in blue on the map the most important centres of this manufacture, as also the natural salt lakes, etc. You will see that really from the entrance of the English Channel northwards along the shore of the Channel, the North Sea, Baltic Sea, North Atlantic and Arctic Oceans, no salt is made. I might except a few places round the English, Irish, and Scotch coasts, where the sea water is strengthened by rock salt, but in these cases the salt is now made more frequently by boiling, and not by the heat of the sun. The sea water only contains from $3\frac{1}{2}$ to 4 per cent. of salt at the most, and frequently less, so that it is necessary to have a considerable amount of solar heat, and plenty of dry weather, to manufacture salt favourably from sea water. The most important districts for the manufacture are —

- (1) The Bay of Biscay.
- (2) The Atlantic coasts of Portugal and Spain.
- (3) The shores and islands of the Mediterranean.
- (4) The south of Russia.

1. The Bay of Biscay has long been noted for sea salt, and from it the celebrated Bay salt has its name. It is well to bear in mind that all solar-made salt is of a coarse grain, like all salt made slowly with a low heat. The quantity of salt made between the mouth of the Garonne and the port of Brest is enormous. At the following, and numerous

other places, salt is made: Quimperle, L'Orient, Belleisle, Bourgneuf, Olonne, Isles of Ré, Oleron and Noirmoutiers, Brouage, Marennnes, etc. The French salt is not exported very largely, compared with that of the next district, but is much used in France.

2. *The Atlantic Coasts of Portugal and Spain.*—The Portuguese and Spanish salts have a world-wide fame, and are preferred by curers of fish to the English salt, though prejudice has much to do with this. The Dutch, Belgian, and Norwegian fishermen use chiefly Portuguese and Spanish salts. The Dutch cling tenaciously to them. The great centres are Lisbon, St. Ubes, and Cadiz. In the immediate neighbourhood of these towns, the manufacture of salt is most extensively carried on. The salt thus made is shipped freely to the River Plate for curing hides, to the United States and Newfoundland, and in fact to all the great fishing centres; and during 1878, owing to the high price of English fishery salt, this salt has nearly driven it out of the foreign markets.

3. *The Shores and Islands of the Mediterranean.*—It will be evident that this extensive district is very favourable for the manufacture of salt. The Mediterranean shores of Spain, the islands of Iviça, Majorca and Minorca, make a large quantity of salt; but the shores of France, having extensive lagoons, are most favourable for the salt manufacture, and at Peyriac de Mer, Cette, Peccais, Camargue, Aignes Mortes, Hières, etc., large quantities are made and exported. Along the whole of the Italian shores, especially at Castiglione, Ostia, Salpi, and Comacchio, also on the islands of Elba, Sardinia, and Sicily, much salt is made. The great centres are Carloforte, Palmas, Cagliari, and Terranova in Sardinia, and Trapani in Sicily. This last port is very famous.

In the neighbourhood of Trieste, and on several of the islands off the coast of Dalmatia, salt is largely manufactured ; also in most of the Ionian Islands, and some few of the Grecian. On the shores of Greece and Turkey but little salt is made.

4. *The South of Russia.*— On the north shores of the Black Sea, and in the Sea of Azof, especially in the shallower portions, and in the neighbourhood of the lagoons, salt is freely made.

The following estimate of the annual production of the solar salt, by the various countries before mentioned, I take from Quenstedt's *Klar und Wahr*, p. 234, published at Tübingen in 1872 :—

“ Spain, Portugal, France and Austria cover a great portion of their needs in this manner (by sea-made salt). The island of Sardinia produces 20,000 tons ; the Papal States 35,000, of which they can sell one half ; Austria 40,000 tons ; France, 200,000 ; Portugal, 250,000 ; Spain, 800,000.*

Many of the salt towns of Europe are indicated by their names ; but it would not do to depend entirely on the name, as there are many similar names entirely unconnected with salt. It is well known that *wich* is a name closely connected with salt towns in England, as *Northwich*, *Middlewich*, *Nantwich*, *Shirleywich*, and *Droitwich* ; yet when we meet with such names as *Norwich*, *Harwich*, *Woolwich*, *Greenwich*, etc., in which the *wich* has nothing to do with salt, it becomes us to be careful, and not generalise too hastily.

* “ Spanien, Portugal, Frankreich, Oestreich, decken auf diese Weise einen grossen Theil ihres Bedarfs. Insel Sardinien, 400,000 centner ; der Papst, 700,000 ctnr. ; wovon er die Hälfte verkaufen kann ; Oestreich, 800,000 ctnr. ; Frankreich, 4 millionen ; Portugal, 5 mill. ; Spanien, 6 mill.”

Doubtless there is a difference in the pronunciation of the *wich* in these words. That *wich* in Northwich, etc., refers to salt is evident. The earliest name of Droitwich was *Wich*; this was previous to the Conquest. "In the year 816, Kenulph, King of the Mercians, gave ten houses, with salt furnaces, in Wich, to the Church at Worcester" (quoted by Dickinson, in *Report on Salt Districts* (Landslips) made to the House of Commons, May 1, 1878). The Wiches in Cheshire are named in *Doomsday Book* as connected with salt. At the present day, the pan-house in which the salt is made is called a *wich* house. The real derivation of this *wich* I do not know; it may be *wic*, a dwelling, or town, or village, but I cannot see its special application to *salt*.

As in England, so in the various Continental salt districts, special names are common. In the Latin districts, that is, where the Romance languages are spoken, we have frequent traces of *sal*. In Spain we have Salinas very frequently; and in the Spanish speaking districts of both North and South America, words compounded of Sal and Salinas are very common, and in most cases indicate the existence of salt. Then we have Salinillas more than once, where salt springs exist. In France, the most noted and ancient salt town is Salins, and another Chateau Salins, and a third Lons le Saulnier. This word Saulnier is the trade name for a salt refiner. In the Pyrenees district, we have Salies several times, indicating salt. In Switzerland and Italy, I find very scanty traces of the existence of salt towns. In Sicily, a town with a saline spring is called Salinellas. The great salt town of Salpi may contain a trace of the name. It was anciently Salapia.

As soon as we enter the great salt territories of Germany, we meet with names indicating them. One of the old names for salt was Hall. Whether connected with the Greek

ἅλας, or only deriving its origin from the same source, I know not. ("Witzige beissende Reden nannte der Athenee, ἅλας." Quenstedt, *Klar und Wahr*, p. 225). Whatever be the origin, many towns producing salt bear it. There is Halle near Magdeburg, on the Saale; Hall on the Kocher, in Wurtemberg; Hallstadt on the Main; Hallstat and Hallein in the Austrian Alpine salt district; Hall in the Tyrol; Reichenhall in the Bavarian salt district; Friedrichshall in Wurtemberg; Leopoldshall in Anhalt; these latter modern salt towns.

From Hall let us proceed to Salz, which speaks for itself. We have the Salza river and the Salz-Kammergut in the Austrian Alps; Salzungen on the Werra; Salzderhelden and Salzgitter in Hanover and Brunswick; Salzwedel in Brandenburg; Salza near Magdeburg; Salzbron in Lorraine. This word also takes the form of Sulz, or Sulze, in Sulze in Hanover; Sulz on the Neckar; Sulzbach in Wurtemberg, etc.

In the Carpathian districts, though so rich in salt, few towns are called from the mines or springs. The Romans mined salt here, and no doubt left their names for towns, as Thorda was originally Salinæ. The great wave of Slavonians swept away these traces. In Transylvania, however, Akna means salt, and Dées Akna and Viz Akna (this latter the Germans call Salzburg) are two noted salt towns. This Akna appears in Wallachia as Okna and Okna Mare, two noted salt towns. I think the unaccented *a* in Hungarian is sounded *o*, so the sounds will be alike.

In looking carefully over this list of names, I find that the great bulk of them are applied to towns where brine springs came to the surface, and not where rock salt exists. This is only natural, for the springs coming to the surface could easily be discovered by the saline efflorescence, even if, as in the American salt licks, the wild cattle had not by

frequenting them pointed them out. Where the salt was only made from sea water, very rarely indeed do we find a name indicating salt applied to the town manufacturing. In Iviça, a Balearic isle, there is Salinas, a town of this kind. No others occur to me. The rock salt in the English *wiches* was not known till 1670, the brine for ages before, probably, to the Romans and Britons. The Carpathian *Okna* indicates rock salt and occasional springs. None of the famous French towns had rock salt except Salzbronn, and its name indicates a salt spring. In the Austrian Alps, and in the Tyrol, we find Hallein, Hallstat, and Hall, and in these cases it appears to be rock salt that has given the name.

THE DANISH INTRUSION INTO SOUTH BRITAIN.

By JOSEPH BOULT, F.R.I.B.A.

ACCORDING to Dr. Freeman, and he is confirmed generally by other authorities, the Danish invasions fall naturally into three periods: First (A.D. 787–855), in which the object seems to have been simple plunder; they land, they harry the country, they fight, if need be, to secure their booty; but whether defeated or victorious they return to their ships, and sail away with what they have gained.

Next comes a time in which the object is no longer plunder, but settlement. During the greater part of the tenth century, we read of few or no fresh invasions from Scandinavia itself; but the West Saxon lords of Britain were engaged for more than fifty years (902–954) in a constant struggle to reduce and retain in obedience the Danes who had already settled in the island. A short interval of peace, the glorious reign of Eadgar follows; but towards the end of the tenth century the plundering invasions of the Danes begin again. They soon assume a new character. The history of England for a long term of years (980–1016), is one record of struggles with the power of Denmark. This forms the third period.*

If the alleged influence of the Danes upon the topography and social condition of South Britain is to be properly gauged, the periods during which that influence was exercised must be carefully noted and remembered.

* *Norman Conquest*, vol. i., pp. 44–46. I have endeavoured to reduce Dr. Freeman's sketch to specific dates, for much of the present historical theory owes its acceptance to the neglect of dates; a careful comparison of which, I believe, would have prevented much crudity.

There are seventy years of plundering, 787 to 855 ; followed by a hundred and twenty years of so-called settlement, 855 to 975, which included fifty years of constant struggle with the Royal House of Wessex ; followed by seventy years of mixed settlement and plunder, including the reign of Hardiknut.

It is gravely assumed that during a connection of this kind, extending over two and a half centuries, the Scandinavians gave names to fourteen hundred places, a thousand of which are in the counties of Lincoln, York, Cumberland, and Westmoreland ; many of which are supposed to indicate an enthusiasm for Christianity, which is certainly remarkable in a people of their habits ; and that this Danish influence subsists to this day, surviving all the vicissitudes of eight centuries. In contrast with this, it seems singular that the same authorities should assume that the influence of the Romans, though exercised for four centuries, should be so evanescent as to have been entirely swept away by a Teutonic irruption.

Before examining the grounds for this very singular assumption, it may be as well to glance at Ireland—

. in the days of old,

.
When Malachi wore the collar of gold,
He had won from the proud invader,—

where the Scandinavian influence was protracted over more than four centuries, 795 to 1265, and see if that lengthened experience lends any probability to any such assumption.

The great modern authority on the traces of the Danes in the three kingdoms is Worsaae, and he relies chiefly upon philology for evidence of their radical and extended influence. As regards the names of places, he affirms that the following terminations are pure Norwegian or Danish ; an assumption, he says, which is placed beyond all doubt (!) by

the compound words in which they appear. The terminations cited are, -by, -thorpe, -thwaite, -ness, -ey, -öe, -with, -toft, -beck, -tarn, -dale, -fell, -force, -haugh or -how, -garth, "together with many others."*

I shall attempt to show that many of these terminals are as much Keltic as Scandinavian; but in the meanwhile will mention that in Ireland, according to Dr. Joyce, there are only fifteen names of places with such endings,† namely, Wexford, Waterford, Carlingford, Carnsore Point, Ireland's Eye, Lambay Island, Dalkey, Howth, Leixlip, Oxmantown, Laxweir, and the three provinces of Munster, Leinster, and Ulster. Of the provincial names, I venture to say, the terminations are Keltic. In Carnsore, the final syllable resembles K. *or*, a coast; the whole, probably, represents *carn-eis-or*, the shore of the people at the Carn; the place, according to Joyce, being sometimes called Carn only. In Ireland's Eye, Lambay, and Dalkey appears K. *I*, an island, which forms the initial syllable of Hibernia, *i. e.*, *I-b-erinia*, the isle of the west; in Iona, *bird island*, afterwards Iocumbkill, the isle of Columb's church. Waterford is apparently *uachdar-farthadh*, the upper ferry, to distinguish it from East Passage just below; a conversion of *uachdar*, analogous to that in the name of Wateresk in co. Down.‡ The -ford, which appears in Wexford, Carlingford, and perhaps in Strangford, may be, as Joyce suggests, from *fiord*; but what is the etymology of *fiord*? There must be some reason why that word was applied to bays, or inlets of the sea. Is it rash to consider it allied to K. *fia-ord*, the land hammer, as indicative of the action by which the inlets were formed—that is, the hammering of the land by the sea? as contrasted with

* *An Account of the Danes and Norwegians in England, Scotland, and Ireland*, by J. J. Worsaae, For. Z. S. A., 1852, p. 67.

† *Origin and History of Irish Names of Places*, by P. W. Joyce, A. M., M. R. I. A., 1869, p. 98.

‡ *Ut supra*, p. 470.

the embouchures of rivers, due, at any rate in part, to effluent water. The Strang-, of Strangford, seems to represent K. *strangadth*, strife, contention; referring to "the well known tidal currents at the entrance," "which renders its navigation so dangerous."*

Joyce informs us that the province of Leinster was previously called Galian, and that the name was changed because the foreign auxiliaries of a certain prince, who settled therein, used a broad-pointed spear of peculiar form, called a *laighen* (layen); he supposes the last syllable -ster to be Danish; and Worsaae says it represents Old Norsk, *stathr*, a place.† Laxweir is apparently K. *leic-suir*, river force.

If, instead of supposing the name of Leinster to be hybrid, search is made for a Keltic explanation, it will be found that -ster is a contraction of -eister; the whole will then read Laigheneister, or the land of the people using the spear called a layen: a name applicable in the third century, when the change from Galian is said to have taken place. Otherwise it must be supposed that the original terminal was changed at the caprice of the Danes. The earlier name of the province, Galian, had reference also to some kind of spear, called *ga*.

The name of Ulster, when analysed, confirms this conjecture; for I apprehend it represents K. *uiliidheister*, the lough people's land; those pieces of water being more numerous in that than in any other province. In an old Irish poem, Ulster is spoken of as Lochland. It has been thus translated‡:

Another journey I went—
Oh Loegaire, but that was an hour!
That I might give great battles
Against *Lochland* on the north.
Siabur—charpat con culaind.

* Joyce, *Op. cit.*, p. 87. † Worsaae, *Op. cit.*, p. 280.

‡ *Journ. R. Hist. and Arch. Association of Ireland*, 1870, vol. i., p. 885.

In like manner Munster represents *Mumhaineister*, i.e., the greater river people's land or country.

To the names given by Joyce he is disposed to add Wicklow and Arklow, names terminating in -gall, and those near the coast which have the prefix *S*. On these I suggest that the -*low* represents K. *lagh*, a common termination in England, to which further reference will be made; that K. *gall* signifies a foreigner of any kind, and not Scandinavians exclusively; and also signifies rock or stone.

In opposition to Worsaae, who gives a long list of Danish kings of Dublin, besides kings of Limerick and Waterford, Joyce considers the paucity of Danish names affords a complete answer to the statement sometimes made, that the Danes conquered the country, and that their chiefs ruled over it as sovereigns.*

The Ostmen, who play a conspicuous part in the history of the Scandinavian period, and whose name appears to survive, in a corrupted form, in that of Oxmantown, a part of Dublin, is assumed by Worsaae to be derived from the Danish Oster,† that is, eastern. Though he says this "name remains an incontrovertible monument of an independent Norwegian town, formerly existing within the greatest and most considerable city of Ireland," I submit that it is not very likely the Scandinavians would dub themselves Easterns, or call their town the place of the Eastern men. It seems more consonant with usage to suppose that the name was applied by the natives to the foreign intruders, and therefore that the signification must be sought in the vernacular. Having done that, the name is resolvable into *osadh-mann*, the bad confederacy, which must be allowed to be appropriate to a town, or entrenchment, which at times was a nest of cruel pirates.

* Joyce, *Op. cit.*, p. 98.

† Worsaae, *Op. cit.*, p. 332.

It appears to me rash to assume that all the harrying of the east coast of Ireland was exclusively by Scandinavians; it is but reasonable to suppose that the constant political and social changes, of which Britain was the theatre, must have occasioned frequent departure of those natives who, being worsted there, anticipated better fortune here; and that the Cornishmen, the Welsh, and the people of Strathclyde, including therein all the country between the Mersey and the Clyde, when debarred from raiding to the east, would have recourse to the west. As commerce ever follows in the trail of war, the intervals of peace would be devoted to the exchange of commodities; for the man of war and the merchantman were then one craft. This conjecture, as yet unmaturing, receives some confirmation from Worsaae's statement, that several of the Danish coins, that is, of Danish kings in Ireland, were minted in the North of England, as well as in Watchet (Somersetshire), Wilton, Winchester, and London. If alliances may be inferred between the Scandinavians and people from South Britain, the appropriateness of the derivation suggested for Ostman is emphasised.

There are various defects in Worsaae's volume which are much to be regretted, such as his hasty assumptions on very slight foundations; and his substitution of Danish for Irish roots of names, without any explanation of the difference of signification. He suggests that the name of Ireland is derived from the Northmen, because he asserts that the termination, *land*, is entirely unknown in the Irish language.* The Irish for land is *lann* (laugn); and Ireland is manifestly *Eire-lann*, the west land, just as Hibernia, in all its various mutations of Iverne, means isle of the west; Erin itself being the genitive of eire, and signifying

* Worsaae, *Op. cit.*, p. 814. Conf. Joyce's instructive remarks on the addition of the letter -d final, after n, l, and r, p. 55.

of the west; its present use a corruption hopeless of correction.

In reviewing the Scandinavian history of Scotland and the Isles, Worsaae deals in a large amount of assumption, which is perhaps excusable in a popular writer who knows he can rely upon general sympathy, but is very averse from any dispassionate inquiry. Where but little is known, and possibly but little if any more can be ascertained, it might be supposed that cautious inquiry was most essential. Such conditions, however, are highly favourable to the growth of theory; and as philosophic doubt is most distasteful to the multitude, they are rejoiced to rest on dogmatic assurance, which is likely to be undisturbed, not because it is well-grounded, but because no one is likely to be such a *bore* as to prove the ground.

Worsaae asserts that "no small portion of the present population of Scotland, both in the Lowlands and in the remotest coasts and isles of the Highlands, is undoubtedly descended from the Northmen, and particularly from the Norwegians. Both the Norwegians and the Danes, wherever they established themselves, introduced their Scandinavian customs, and preserved, in all circumstances, the fundamental traits of their national character."* It would be inopportune now to controvert this proposition in its entirety, but it should be remembered, as facts will be adduced with which it is irreconcilable; meanwhile it may be asked, how far the conversion of those heathen pirates to Christianity, and their alleged zeal in its cause, as manifested in the numerous places named after kirks and crosses, is consistent with deep-rooted attachment to their Scandinavian customs, and the preservation, in all circumstances, of the fundamental traits of their national character?

* Worsaae, *Op. cit.*, p. 198.

Space will not permit of a specific examination of the Scandinavian period in Scotland, nor is it so requisite as in Ireland, since there is a closer resemblance between North and South Britain than between Ireland and either; but as an instructive illustration of the course I conceive such an inquiry should take, refer to Worsaae's allegation of the inhospitality of the Shetlanders, in the following form. It is said that they "would not willingly give a traveller a night's lodging, and directly at daybreak they awoke him, saying, *Myrkin i livra; lurein i liunga; timin i gvestin i geunga*; that is, 'It is dark in the smoke hole, but it is light on the heath, and for the guest it is now time to depart.'" He adds, "That this sentence, which was written down in the year 1774, consists of old Norwegian words, though in a corrupted form, is quite evident."*

Now, with reference to the alleged inhospitality, the English have not been regarded as usually deficient in that virtue; yet with them the proverbial rule for a host is, "Welcome the coming; speed the parting guest;" dating, probably, from a time when there were no inns; when the traveller journeyed on a horse, which carried his own provender and his master's food, and wearied and wayworn both steed and rider coveted their beds before anything but a preliminary wash and rub down; and when the road must be taken early if they would not be benighted. Fifty years ago, in Shetland, habits were very primitive, and are said to be little changed to this day.

With regard to the words put into the mouth of the host, and freely translated, you will observe Worsaae ascribes them to old Norsk, *though in a corrupted form*; if he had ascribed them to old Gaelic, that is, Erse, I think he would have found the apparent corruption less, and the signification somewhat more pertinent. In Irish it would stand as fol-

* Worsaae, *Op. cit.*, p. 226.

lows: *Murac i leaba-fhrasich ; luaigh-rian i liu-unga ; tim in geist te i ga-ungna* : "It is gloomy on the bed of heath, but the way is pleasant for the foot to pursue ; it is time for the custom-person to his footing." It was gloomy in the reeking cabin within which the heather-bed lay long after break of day, or even after the sun's first rays appeared ; and it was time the traveller was afoot if he would make the most of daylight. Phonetically, I believe there is not much difference between the Irish form and the words actually quoted by Worsaae from Hibbert ; literally, the words I have rendered *foot*, O'Reilly glosses claw, talon, nail, hoof ; and in the words *geis-te*, for custom-person, probably customary person would be more idiomatic ; it being customary to give entertainment to wayfarers ; in some cases it was compulsory to do so, as part of the tenure by which land was held. The resemblance between the English guest and *geis-te* is noteworthy.

These verbal similarities, and others which will come under notice, seem to indicate a prior relationship between the native and the invader, rather than the supremacy of the latter.

A.D. 787 is the date usually assigned to the first Danish aggression upon England, and that for plunder only. At Dorchester, ten years later, 797, they are spoken of as ravaging the Anglian (? Sacsan) coasts ; they appeared again, in Somerset, in '828, and, after several successful raids, sustained "a tremendous overthrow" at Ockley, in Surrey, in 857 ; after which they withdrew, broken and dismayed, leaving the land a respite of a few short years.*

Ægberht's successful reign lasted from 800 to 838.

The pact between Alfred and Guthrum, Gudrum, or Gorm, was made in 878 ; and no sovereign authority can be ascribed to the Danes before that date. It was a condi-

* Pearson's *Hist. Eng. during the Early and Middle Ages*, 1868, vol. i., p. 151.

tion of the pact that the Danish leader should be baptised; and it may be assumed that up to that date the Danes did not profess Christianity.

On referring to Kemble's *Codex Diplomaticus*, vols. i. and ii., there will be found, in documents under date 833, the names of places which include the terminals -beck, -by, -toft, and -thorp; these, it may be remembered, with others, are claimed by Worsaae as "pure Norwegian or Danish." The names of places referred to are Holbeck, Pinchbeck, Guernthorpe, Langtoft, Algarkirk, and Peakirk. But -thorpe also appears in documents dated 806 and 819; and -ey as early as 725, in the reign of Ine, sixty years before the first Danish aggression, and a hundred and thirty years before settlement. Worsaae's comment on these facts, and on the resemblance between contemporary monkish names and Scandinavian names, is instructive. They not only prove, he says, that the Danes really had such a footing round the Wash that they could give their villages Danish names, and were governed by their own chiefs, but they likewise indicate the remarkable fact, that at least a great number of those Danes must have been already Christians, since they had villages with churches, and gave landed property to a convent, in which we find both Danish monks (Eskil and Thurstan), and a Danish abbot (Sivard). I hope to be able to show, in conjunction with other evidence, that the facts referred to are more indicative of relationship between Kelts and Danes. There seems to be some uncertainty among philologists whether the word *kirk* is to be regarded as exclusively Scandinavian, or as appertaining to the Anglo-Saxon speech also. Mr. Wedgewood derives the word *church*, which is manifestly only another pronunciation of the same word, from the Greek *κρηναριον*, and says A.-S. *cyrice* is a natural modification of the Greek; but does not show any use of the Greek word before the sixth council, A.D. 680;

so that it is not impossible that the Greek is a southern form of the northern *kirk*.

Mr. Pearson* suggests that the root may be found in the Welsh *cyrch*, a centre, and *cyrchle*, a place of resort; and the French *cirque* seems allied to these, as also the Latin *circus*, and the Greek *κίρκος*.

That there was some relation between the form of the circle and the church seems undoubted, arising, possibly, from various causes, such as the conversion of heathen temples, like Stonehenge, to Christian purposes; and to the symbolism of eternity by the ring. K. *ciorcall* or *siorcall*, formed of *sior-cail*, signifies a continuous path. It may be observed that the churches of the Knights Templars were circular on plan. The K. word *fairigh* (fairy), one of those which denote a parish, conveys ideas similar to those associated with W. *cyrch*, being compounded of *igh*, a ring; *cyrch* also signifies a ring. The prefix *fair*, as a noun, denotes a ridge or eminence, and also the rising of the sun; as a preposition, *fair* means on, or upon. Taken substantively, *fairigh* may indicate a temple on an eminence, or one dedicated to the rising sun. Taking *fair* as a preposition, *fairigh* may refer to the rings said to be formed by the fairies dancing, and named fairy rings. Possibly the appellation of Good People, given to fairies, was suggested by the resemblance between their name and that of the church; and continued from a politic desire to conciliate those mysterious beings, who could be malignant. *Fairigh* would come to denote the parish, as the district surrounding the church.

Reverting to the word *kirk*, possibly the root may be found in the most primitive known form of the Keltic speech, the Erse; in that two words, *ca-erc* (*kauerk*), closely approximate to *kirk* in sound, and signifying the house of heaven, literally heaven-house. Allied to them are *iorghius*

* Pearson, *Op. cit.*, vol. i., p. 79, note.

(eorwish), prayer, or more literally a heavenly wish ; and *iorcaire* (eorkare), friends who hold a monthly commemoration, or prayers, for the dead. Or, if a heathen trail be preferred, it may be found in *cairceat*, from *cair*, an image, and *ceat*, a pillar or prop. Allied words are *cairn*, a heap of stones ; possibly *cair-nith*, the image of slaughter, i.e., the slaughter of man ; one purpose assigned to the cairn being to mark the place, and perpetuate the memory of murder, or of death from accident. The bringing together of stones, either for monuments of departed heroes or for temples of idols, may have led to such an application of the name. Then *cairneach*, a priest, a druid, a sacrificer, is not an improbable contraction of *cairnithach*, since it has itself been contracted into *carnach*, and even *carn*, both terms for a Pagan priest, a Pagan altar, a pile of stones ; hence, probably, the name of Karnac in Brittany. A confusion between *ca-erc* and *cairceat* would resemble many other instances, arising partly from a confusion of dialects, and partly from prejudice, religious or otherwise.

If all places in the names of which the word *kirk* appears are to be ascribed to the Danes, the question naturally arises, Where are those churches which had been erected previously by the Anglo-Sacs, and by their predecessors, the Christians, during the Roman sway ? The great monastery of Bangor-ys-Coed, near Chester, with its two thousand inmates, is not likely to have been the only Christian community in South Britain ; they were Christians who achieved the Alleluia victory in the seventh century ; and it is impossible to doubt there were Christians with organised societies and places of worship for centuries prior to the preaching of S. Augustine, whose mission was to draw heretical Christians into the Roman Church, by which they were deemed heathen, just as, until twenty years ago, Protestant Britain was in *partibus infidelium*. It is true there are places which

bear the name of Eccles, and its compounds, as Eccleston ; and others in which the word church appears, as Churchtown and Dymchurch ; but *church* cannot be regarded as other than a modification of kirk, the hard c or k being softened into ch ; and thus it is as much Danish as the strictest kirk. Eccles, and its compounds, Ecclesfield, Ecclesham, Ecclesall, Eccleston, etc., some people assign to a Greek root, which is supposed to have been imported by some ecclesiastical influence, and to have become so far vernacular as to be adopted in local names. Probably most persons would prefer an indigenous root, as more consonant with practice ; and K. *eug-lios*, or *ecc-lios* (ecclis), a burial-place, literally death enclosure, is not very dissimilar. From the Doms of Ethelred and Cnut, it appears there were formerly four grades of churches, namely, a chief minister, a minister of the middle class, one yet less, where there is little service, but where there is a burial-place, and a field church where there is no burial-place. Thus the names compounded of Eccles may indicate the existence of ministers of the third or lowest degree.

The Cross is allied to the Kirk ; but as it occurs in the names of places, it is doubtful if the word cros has any relation to the Rood, but is a topographical term, denoting land in which the remains of trees are found : K. *ce-ros*, the earth wood. This is still the character of the soil in the townships of Great and Little Crosby, of Croston, and Crossens, in this neighbourhood, though much of the arboreal remains has been removed ; some of the timber having been so sound as to be fit for building purposes and for furniture. I am informed that the soil of Crosthwaite, between Derwentwater and Bassenthwaite water, and of Crosby Ravensworth, in Westmoreland, near Shap, is of the same description. It is extremely difficult to obtain reliable information as to the nature of the soil in other places, of

which the names contain the same prefix, as most of those places are obscure ; but it is not improbable the similarity is strong enough to justify the assumption of such an occasion. Doubtless there are names to which a different root may be assigned ; all that is insisted upon is the probability that in many places the name has been suggested by the peculiarity of the soil. To the name Rimrose, a similar signification attaches, from K. *roimh-ros*, earth wood ; and in the bed of Rimrose brook there is a large accumulation of arboreal deposit.

The name of Crosby Ravensworth, to which reference has been made, seems allied to that of Kirkby Ravensworth, in Richmondshire, in the North Riding of York. The latter place I have not seen ; but to the railway traveller scarcely anything can be more desolate than the broad expanse of moorland which lies east of the Lancaster and Carlisle railway, between Tebay Junction and Shap Wells. Both townships abound in remains ascribed to the ancient Britons, especially tumuli. Canon Greenwell's examination of some of those in Kirkby Ravensworth are well known. It is undoubtedly probable that a considerable population was assembled in this wild region ; but it is impossible to believe they were voluntary settlers, much less triumphant conquerors. Yet, if the names of Crosby and Kirkby are infallible tokens of Danish settlements, and *Raven* of the presence of the "Danebrog," the conclusion becomes inevitable that this bleak moorland, which now is fit only for grouse and sheep, was a smiling country, perhaps ultimately wasted by the "Ravenlandeye," *corvus terrae terror*. Such extravagance may be left to those who believe that Clio neglects dates and probabilities when compiling her story of events ; others will perhaps be willing to believe that all these names, even Ravensworth, may be Keltic, and memorials of unhappy exiles, driven by rude enemies from the vales and fertile lowland to the shelter of the hills, thence called Kymbri,

and giving their name to Cumberland (Kymbrilaugn). Canon Greenwell suggests that the tumuli contain remains of a people comparatively civilised, who lived a thousand years B.C. If so ancient, then this region may have been more than once the theatre of similar events; but possibly the signs of civilisation which he found were gifts, thefts or purchases from the lowland stranger. The root of the first part of Ravensworth may be found in K. *ribheann*, the royal hill, on which, according to O'Donovan, royal companies or parleys were held. In Kirkby Ravensworth, such a hill appears in the ridge dividing the Watershed of Swāle dale from that of Tees dale. High Feldom is manifestly the rock or cliff of the dooms, K. *faile-do-meas*. In Crosby Ravensworth, the trace is uncorroborated by any name recorded on the Ordnance survey; but the royal hill may well have been one of two eminences not far from the village, possibly that which stands on a sort of promontory between Dry beck and Lyvenet beck. The final syllable *worth*, A.-S. form of K. *geart*, milk, is analogous to the numerous "pastures" or "lands" with which the neighbourhood of the two Ravensworths is studded, like oases in the desert.

Between the Ravensworths lie Ravenstone dale and Ravenseat moor, forming a triangle with Kirkby Stephen at the north apex. The name Ravenseat is clearly K. *ribheann siah* (reevagn shee); *sigh* signifying hill, generally, while *beinn*, from which the second syllable of *ribheann* is derived, denotes the summit, as in the modern words ben and pen. *Sigh* appears as *seat* in the names of several hills in Cumberland and Westmoreland. In Ravenstonedale the royal hill appears to be represented by Wandale Hill, in which name the prefix *wan-* seems allied to K. *uanid*, a chief or great person; but the hill may have been on the other side of the Rawthey at Bluecaster, which sounds like a Roman fort, and near which is a place named Raventhorn.

In Ravenglass, on the coast of Cumberland, the *ribheann* is apparently occupied by the castle of Muncaster; the site having been also a Roman position. Standing on a promontory between the rivers Esk and Mite, Kelt, Roman and mediæval baron would be alike secure from surprise. The Raven crag lies a little east of the town. The affix -glass denotes its proximity to the sea, K. *glas*; and Ravenglass is at the place where three streams, the Irt, Mite, and Esk combine, just before being lost in the sea.

If, in Ravenmeols, on the coast of Lancashire, and Ravenspur, on that of Yorkshire, corroborative evidence is not readily to be obtained, the changes which have been wrought on those coasts must be considered. On the east, it is probable that many square miles of country have been washed away; on the west, that a still larger extent has been buried under drift sand; in either case the *ribheann* may be lost, or only traceable after minute documentary as well as topographical search. In Ravensmeols, near the old burial-ground and modern church of S. Luke, is an eminence, bearing the name of Shorrocks Hill, which may be a contraction of K. *Siorramachd*, a county, shire, or sherifdom; and Shorrocks Hill would represent a hill on which the shire-motes were held, in succession, possibly, to the *ribheann*. The name of Shire Lane, for a neighbouring road, is corroborative of some such occasion; otherwise I should be disposed to assign the *ribheann* to the eminence in Ince Blundell Park upon which the Blundell tower stands, itself looking like the reminiscence of an ancient Tor.

On the east coast, the utmost part of the promontory of Spurnhead was called by some people Conny Hill, when Bishop Gibbons published his edition of *Camden*, a name which is manifestly related to K. *Conn*, counsel; *Conn-alt*, counsel-house, was one of the names of Tara. That extreme point would possess the security arising from isolation, which is

so characteristic of eminences selected for folk-motes; like the islands on which the generals of contending armies have negotiated peace. Patrington, in the immediate neighbourhood, is said to represent the Roman town Prætorium.

The latter parts of the names of Ravenmeols and Ravenspur, I believe are distinctively Keltic. The meols, as I have endeavoured to show on other occasions, are the great plains, K. *magh-ull*, recorded in the name of Maghull, otherwise South Mails. In Ravenspur and Ravensore, the post-fixes are both Keltic, *i.e.*, *spir*, a shank, or *spor*, a spur; and *or*, a coast.

The *Thing* is usually regarded as an institution exclusively Danish. Such an assumption is additional evidence of the careless way in which earlier indigenous evidence has been overlooked. It is mentioned in the 8th of the Dooms of Hlothaire and Eadric (685) as follows: "If one man make a plaint against another in a suit, and he cite the man to a 'methel' or to a 'thing,' let the man always give 'borh' to the other, and do him right as the Kentish judges prescribe to them."* The fact is, "thing" is *ting* (theeng), tongue; and very likely appears in the names of places compounded of ting and tong, as Buntingford, Huntingdon, Knottingley, and Tonge. The name of Nottingham is usually derived from the caves in the hill on which its castle stands. Enthusiastic but heedless disciples of Mr. Kemble would doubtless improvise a tribe of *Nottingas*; but both suppositions overlook the fact that there are at least four places called Nottingham in Britain, namely, in Caithness, Gloucestershire, Kent, and the shire of the name; there are also Notting-hill in Middlesex, and Nottingham in Dorset. It is not likely there is a hill with caves in all those places, or that the *Nottingas* scattered themselves about the country so capriciously. But wherever there are hills, the suppo-

* Thorpe, *Ancient Laws and Institutes of England*, vol. i., p. 81.

sition that they are the sites of ancient assemblages for voting supplies and promulgating laws is confirmed ; and the castle of Nottingham may be the latest representative of a hall like Tara's. So the name of Blencathara for the hill usually called Saddleback. The numerous Tors, the Law or Low hills, even the name of Thor, the deity, may all be referred to the same usage. The name of Thurstan, which Worsaae claims as distinctively Danish, and which appears in Cheshire in Thurstanton, Wirral, is another name for Conis-ton Water, with which it is almost synonymous, denoting the counsel people's place ; for K. *tan* (taun), signifies a country or territory, and so the root of the English *town* and the Scotch *toon* ; just as K. *am* (aum), people, is the original of the A.-S. *ham*, and the English *home*.

The word *-strath* is sometimes claimed as Scandinavian, though I do not find it in Worsaae's volume. It appears in the name of Strathclyde in the middle of the sixth century, if not earlier.

Worsaae says there are six hundred and four names of places in England with the affix *-by*. He disclaims Tenby in South Wales, and Denbigh in North Wales, but does not assign any reason ; and he omits all reference to its use as a prefix in the names of places, as in Byfleet, Byland, Bywater, etc. He says *-by* is from O. N. *byr*, first a single farm, afterwards a town in general. There is no doubt that the name of many towns is derived from a single house ; and in various parts of the country, townships are to be found in which, at this day, there is only one house, with a few cottages or hovels for labourers. That was the condition of Noctorham, Wirral, a dozen years ago. But the word *byre* is still in use to denote a cow-house, and represents K. *buar*, glossed by O'Reilly as cattle of the cow kind. I apprehend, however, that *buar* is compounded of *bo* (boo), a cow, and *ar* (aur), slaughter, and that the *buar* were the cattle selected

from the herd for food. These would be kept apart until required, and with the progress of civilisation fattened for food. Thus their pen, or house, would be called the *buar-tigh*; when contracted into *buar*, it would be modified into *byre*, by the process that leads a Welshman to pronounce *u* as *y*.

Milch cows, for the protection of their calves, and for convenience, would also be tied up in the *byre*. I must leave it to Mr. Wedgewood to determine whether the Kelts called a cow *bo* from the sound it makes, or whether the sound is called a *boo* from the animal out of which it proceeds.

So far I have accepted Worsaae's premiss that *-by* is derived from *byr*; but, without asserting this has not happened, I am disposed to think that on occasion it may have been formed from K. *bith* (bee), the living, W. *byw*, living; or *bid* (beed), a hedge or enclosure. To the present day, the room in a farm-house, or cottage, which the family occupy during the day, is called the living-room; and it is possible that *Derby* meant *the living oaks*, or the *oak-living*, meaning the residence among the oaks. Again, one of the most important of the old dooms was the maintenance of *borhs*, which I understand to represent K. *bo-ur*, the ox-limit, or fence; being the enclosure, the gates of which were closed at night, and sometimes guarded, to prevent the straying or abstraction of cattle, and other evil practices. Every man was required to belong to some *bohr*, which was responsible for him—his bail and surety—if he became amenable to law. In those days, as in Rome, cattle were not only property, but money, the medium of exchange, value being computed in the number and fractional parts of cattle, there being equivalents for the fractions. *Derby* would thus denote the enclosure in the oaks.

That *byre*, *buar*, or *borh*, *i. e.*, *boour*, have been commuted

into -by, receives confirmation from the name of Greasby, in Wirral, Cheshire, which is recorded in *Doomsday* as Gravesburie.

There are yet other Keltic roots to which the affix -by may be ascribed, as *fidh* (fee), a wood, which by substitution of *b* for *f* would take the sound of *bee* or *by*; and thus Derby might denote the oak-wood, and it is well known the wood of *West* Derby was very extensive.

There are also the words *bath* and *both*, each signifying a hut, booth, tent, cabin, or cottage; they are derivable from the Keltic word for cow and cattle, *bo* being the singular, and *ba* the plural form.

Bo-tigh (bothy) is still in use in Scotland for a cowhouse, or a hovel; its use as indicating a residence for man being due to the quartering of the hinds, herdsmen, or farm servants, under the same roof with the cattle. This form of the word appears in *booth*, so common in Cheshire and Lancashire, and in Bootle. The plural form gives name to the city of Bath, which from its thermal springs was the most noted place in the country round, and so called *the* Bath. Thence also may be derived the application of the word to all the different forms in which water is applied externally, and to the application itself, as *bathing*. The correct Keltic pronunciation of *bath* was *bau*, analogous to that of *rath*, of which, according to Joyce, there are eleven hundred applications in Ireland. In seven hundred of these, the form of spelling is preserved, but the pronunciation is anglicised into *rath*. In the remaining four hundred, the Keltic pronunciation survives in its original or modified sound of *raw*, *rah*, and *ray*.* If it be assumed that the word *bath* has undergone similar changes, the transition from *bay* to *by* is not very remote. In fact, K. *badhbh* (bayv), a tract of land, approximates to that sound. The name of Tebay,

* Joyce, *Op. cit.*, pp. 40 and 253.

in Westmoreland, appears to represent one of the transformations into *-by*.

Names like Frankton, Frankford, Normanton, Saxton, Saxham, Saxmundham, and Saxhead, appear referable to a time when the Franks, the Normans, and the Sacs were strangers in the land, and, settling in those places, had their national names applied by the indigenous population, just as the names of Welshpool in Montgomery, Irishtown in county Dublin, and Irishford in Meath, are attributable to the Welsh and Irish people respectively. If this supposition is probable in those names which end in *-ham*, *-ford*, *-ton*, and *-head*, why should it be less probable when the endings are *-by* or *-thorpe*? If Normanton is due to one or more Norman settlers, why not Normanby? If Saxton, Saxham, Saxhead, have reference to Sacs, why not Saxthorpe, Saxby, and Saxelby? And why may not the like test be applied to Danbury, Danby, Danefield, and Danhall, as indicative of similar casual settlements by Danes? It is, however, possible that some or all the names quoted may be purely topographical, without any reference to foreign intruders of any kind; for in Ireland *dan-* is not a rare prefix, and appears in districts into which it is not supposed the Danes ever intruded, as Dangan in counties Cork and Galway, Danmullan, Tyrone, and Danragh Lough in Donegal.

Thus it would appear that the terminal *-by*, instead of being due to foreign intruders and one era, is an assimilation of various sounds, derived from numerous roots, all embodied in one language, but possibly dating from many different periods.

To the following terminals, Worsaae ascribes the respective meanings annexed: *-thorpe*, a collection of houses separated from some principal estate, a village; *-thwaite*, an isolated piece of land; *-næs*, a promontory; *-with*, a forest tarn, a small lake, water; *-fell*, a rocky mountain; *-force*, a

waterfall; -haugh, or how, a hill; and -garth, a large farm. The Keltic substitutes I venture to propose as more probable are, for -thorp, *clorbh*, grass, which among pastoral people would be a reason for forming a detached hamlet; of this it must be admitted thorp is a corrupted pronunciation, arising from the substitution of an initial t, pronounced th for d, and of p for the v sound of b aspirated; for -thwaite, *tuath*, a territory, tract of land, or lordship; derivatives from *tuath* are *tuathcleas*, a rustic trick; *tuaithe* and *tuaitheach*, rural; *tuaitheach* also signifies a rustic, a countryman; *tuaitheamhuil*, clownish, boorish; and *tuaithlíos*, a country house; for næs, *neas*, a hill or promontory; for -with, *fidh*, a wood; for -fell, *faill*, a cliff or precipice; for -force, *foras*, increase, augmentation, or depth; for -haugh or -how, *a* (au), a hill or eminence; for -garth, *gart* (garth) standing corn, a field or garden. As gort, this word is in constant use in Ireland. Unless tarn represents *tamh-eirne* (tauearne), literally ocean-, that is, water-fragment, I have not found the Keltic equivalent, nor for -toft, -holm, -vig, and -rigg; but for -beck there is *baic*, crookedness, like K. *cam*; and for -dal, the same form of word, signifying a share or division, a tribe or family, the land possessed by a tribe, a plain, field, or dale, and an assembly.

Among other evidence which Worsaae has adduced in support of the theory of the Danish planting of England are the names of persons, a kind of evidence which must be esteemed of very doubtful value. He affirms that the termination -son or -sen, which never appears in Saxon names, frequently occurs.* But ap-, O'-, and Mac- prevailed among the Kelts, and it seems but natural that the English, at any rate, living in the same islands, should have an equivalent; and it is surely a supposition very far fetched, that the son of John could not be turned into Johnson without the assist-

* Worsaae, *Op. cit.*, p. 80.

ance of the Scandinavians. But Worsaae has overlooked the use of this affix in the names of places in Cumberland and Westmoreland, which I have not noticed elsewhere. In the names of Robinson, Benson, Lawson, Rawlinson, the affix -son is apparently K. *sun*n, an enclosure, and Benson, or Penson, is the enclosure on the hill-top; Robinson, on the road at the hill-top. The name Robin as the name of a place denotes its position by a road at the top of a hill; but as a Christian name, I apprehend, Robin is derived from the Redbreast, in these latitudes the universal friend and pet of man, who naturally applied the name to his pet son, just as he playfully called him a little monkey or a young urchin, that is, piggy-wiggy, from K. *uircin*, literally the earth kin. Pigs are still called urchins in Lancashire; hedgehogs generally bear that name; and the sea-urchin, common on our coasts, derives its name from a resemblance to the hedgehog. The Robin is the wound-bird, K. *rubh-en*. Its other Keltic name, *ruddock*, signifies redbreast, *ruadh-occ*.

Some of the personal names claimed by Worsaae as Danish are apparently compounded of Keltic words as—

Anlaf — *an-lagh*, great order; or *an-lamh*, large hand.

Eric — *eiric*, reparation; *eireachd*, beauty.

Oscytel } — *os-ceidil*, above conflict.
 Ascytel }

Thorketil — *tor-cet-il*, great counsel mouth.

Olaf — *ollamh*, a chief professor in any science, therefore a learned or studious person, a *beau-clerc*; *oll-amha*, a great person.

Wulfstan — *ull-feas-tan*, prince of great understanding or wisdom.

Ulfketil — *ull-feas-cet-il*, very great wisdom mouth; one renowned for wise speech.

Edmund — *Ead-mann*, the bounteous giver of protection that is, the generous protector.

Offa is the name of a townland in Tipperary.

An instructive illustration of the dangerous character of Worsaae's advocacy is presented by his assertion that the English word *by-law* is still used to denote municipal or corporate law, and is neither more nor less than the Danish *By-Lov*; consequently it must have retained its name ever since the time of the Danes. This word, he says, shows that the Danes must have had at least some share in developing the system of judicature in the English cities.* One would like to know where is to be obtained the information that municipal law is in this country termed *by-law*, and how Worsaae and his informant would interpret the words *by-place*, *by-street*, *by-play*, *by-word*, and the like.

It does not appear from the *Dooms*, edited by Thorpe, that the Danes introduced any very important changes into the ordinances for the government of the country. Were the series of *Dooms* complete, it would probably be found that the changes which occur are the result of altered circumstances, produced in the lapse of centuries. Though in the present day zealous people emphasise their dislike of political change by professing attachment to law and order, in earlier days, law *was* order, K. *lagh* being the equivalent to order. The Danelagu was that part of the country under Danish sway, including the whole of south Britain under Cnut, and the north-eastern portion only under Guthrum.

The tax levied on intestates, the heriot, does not appear before Cnut's reign; but from the wording of the ordinance the object does not appear to be the imposition of a new doom, but the regulation of a custom which had become

* Worsaae, *Op. cit.*, p. 159.

oppressive, or might be exercised oppressively. As translated by Thorpe, it reads as follows :—*

71.—And if any one depart this life intestate, be it through his neglect, be it through sudden death ; then let not the lord draw more from his property than the lawful heriot : And, according to his direction, let the property be distributed very justly to the wife, and children, and relations ; to every one according to the degree that belongs to him.

72.—And let the heriots be as it is fitting to the degree, an earl's such as thereto belongs, that is, etc.

73.—And where the husband dwelt without claim or contest, let the wife and children dwell in the same, unassailed by litigation. And if the husband, before he was dead, had been cited, then let the heirs answer, as himself would have done if he had lived.

These dooms appear perfectly consistent with the declaration embodied in Cnut's first doom, *i. e.*,

“ This is then the first that I will : that just laws be established (that man-righte laga upp-arære), and every unjust law carefully suppressed, and that every injustice be weeded out and rooted up, with all possible diligence, from this country. And let God's justice be exalted ; and henceforth let every man, both poor and rich, be esteemed worthy of folk-right (folc-rightes wyrtha), and let just dooms be doomed to him.”

The words rendered by Thorpe *heriot* are *here-geata*, which he explains in the glossary as signifying *apparatus bellicus*, *military habiliments* or *equipments*, which is perfectly consistent with Cnut's definition of the render “ fitting to the degree.” According to Bosworth, *here-geata* is what was given to the Lord of the Manor to prepare for war. But it is difficult to convert *here-geata* into *heriot*, and the definition applies only to earls and thanes of every degree, that is, the compensation the king was to receive for the loss of the leader of a contingent in his army. The render, or

* Thorpe, *Op. cit.*, vol. i., pp. 337 and 413–417.

succession-duty, from men of inferior degree is not defined, but the lord was not to draw more from the property of the intestate than his *rightan here-geata*. But in addition to the equipments, the king was to receive money — “mancuses of gold,” or “pounds”—according to degree. The under-lords could not always obtain money, and would doubtless commute in kind, according to the custom of the manor, and thus obtained the tenant's best horse or best beast; and as beasts were at one time money — *pecunia* — the custom of taking the beast would prevail, as in paying rent, and be maintained.

The word heriot appears, then, to be of Keltic origin, that is, *eirigh-adh*, the lord's beast, or possibly *eiric-odh*, the entire ransom, the relief, to use a later term, which enabled the heirs to divide the residue of the estate. Probably, however, there is here another example of that substitution of one word for another of somewhat similar sound and signification. The *eirigh-adh* was levied upon all degrees except men of thane rank and upwards; in common parlance, therefore, that word would take the place of *eiric-odh*, especially after reliefs were extinguished. The heriot subsists to this day in many manors, though extinct as a regal or national aid.

The theory that the Danish inroad into Britain partook of an immigration of foreigners, and a supplanting by them of the indigenous people, appears to rest chiefly on an erroneous interpretation of the names of places. It is perhaps excusable in Worsaae, himself a Dane, that he should readily accept and support an opinion so flattering to his national pride; but it is difficult to understand the acceptance which that theory obtained from preceding historians. They had before them the facts that Britain had enjoyed all the advantages which could be conferred by the

prolonged residence and favour of the most civilised people of their day; it had been the resort of those beggared in fortunes and in health, for the recovery of both its visitors, or temporary residents, were many of them Christians, who had succeeded in diffusing their tenets among the native population, so that there had been confessors, martyrs, and religious communities; those visitors had introduced political and municipal laws, the most developed jurisprudence the world had then known; a scheme of legislation which to this day is regarded as the most philosophical of any known system; they had an effective fiscal establishment, and probably there is not any one feature of government which is so distinctively an indication of progress in civilisation as simple and effective taxation. In addition, they introduced all the then known arts, mechanical and imaginative, in their most finished state; and their orators, poets, and historians agreed in commemorating the wealth and the beauty of this possession, and the advantages it yielded to the empire. It is idle to assert, without evidence of the clearest and most unmistakable character, that all these and all their fruits were swept away by the inroad of Teutonic and Scandinavian barbarians.

On another occasion,* I have attempted to show how utterly baseless is the Teutonic theory of subversion and ruin, and will not dwell upon that subject now, but, turning from Britain of the Romans, glance at Denmark or any other part of Scandinavia, and in what state were the people then and for centuries after? They were the denizens of a wild and inhospitable region, abounding in swamps and forests; they were rude and uncouth barbarians, who probably never saw the face of a Roman, though they may indeed have heard of the Roman name, on some of those occasions

* *Trans. Hist. Soc. L. and C.*, 1878. See also, *A Neglected Fact in English History*, by C. H. Coote.

on which they bartered amber, the ivory of the Walrus, furs, and other raw natural products, similar to those so recently obtained from the Eskimos. The descendants of people leading lives so secluded and barbarous would develop but very slowly, whilst the commerce of Britain thrived and extended so that, as Worsaae says, the German Ocean was then known as England's sea; and if a merchant thrived so that he fared thrice over the wide sea in his own craft, he was thenceforth worthy of thane-right, that is, became a thane for life, or *quamdiu se bene gesserit*;* and wealth accumulated in spite of desolating civil wars, and learning and art thrived, so that when Charlemagne desired to promote intellectual study among his people he induced Alcuin to leave the attractions of the North-Anglian court to assist in that honourable project.

Yet it is gravely asserted that such a people as the Britons were indebted to the Danes for the settlement, or re-settlement, of large tracts of country, the development of their commerce, the cultivation of a love for poetry and history, and the introduction of the Udal tenure of land; also of *things* or assizes, of trial by jury, of "a numerous class of independent peasantry, who formed a striking contrast to the oppressed Anglo-Saxon community," the preservation of popular liberty, and, above all, the spread of Christianity.

It is impossible here to enter upon a detailed refutation of these claims; some of them are inconsistent with the evidence already submitted, others may be examined on future occasions; but surely there are obvious facts which are wholly inconsistent with such a draft upon credulity.

The Danes were a nation of heathen barbarians. At the end of the eighth century, incited by the love of adventure and the lust for rapine, they began to harry the shores

* Worsaae, *Op. cit.*, p. 6.

of Britain, making their first recorded attempt on the *south* coast. About the middle of the ninth century, they begin to effect settlements, and their efforts continue amid civil war for one hundred years ; then during the reign of Eadgar, an interval of peace ; and then the Danes return to their old habits of plundering, their settlements being too precarious ; and finally their efforts practically expire with Cnut, so far as South Britain is concerned.

It is difficult to discern at what period it was possible for the Danes to accomplish all the good which is attributed to them. No one acquainted with history will deny that they did exercise important influence on the destinies of Britain ; but dispassionate inquiry seems to render it probable that their influence was political rather than national, personal rather than dynastic. Though both Sweyn and Cnut retained, or desired to retain, their sway in Denmark, they preferred a residence in England, probably for the like inducement to that which governed the Norman Duke, the greater wealth and the greater civilisation of South Britain. These led both Dane and Norman to regard their continental possessions as appanages only, of great value and importance, it is true, but of value and importance second to that of their island throne. This preference, so strongly marked and so persistent, is itself evidence of great weight which cannot be lightly set aside.

Before the armed intrusion of Dane or Norman, it is almost certain that England was the resort of individual Danes and Normans, in pursuit of that wealth and other advantages which were to be gained in Britain, just as before and during the Roman occupation of the country the Belgi and Sacs had settled there in small numbers. The increase of those numbers, and the reports they sent home, no doubt induced those armed expeditions which terminated in conquests more or less complete. But the indigenous popu-

lation — the landed magnates and others — did not combine in sturdy opposition; they chose sides as most consistent with personal advantage or prejudice, just as is seen in all political contests even to the present day. There was no national, nor even local patriotism, as that word is usually understood, but merely personal manœuvres, or party contests for personal advantage.

Through all, mid direful suffering to many, the country throve; it grew in wealth, in learning, and in the arts, and it delighted in testifying devotion to religion by the erection of churches and by religious foundations. Those should not be ascribed to one section only, nor to one race, for the whole country participated, as is witnessed by the remains which each part retains in proportion to its wealth and its population, the minster prevailing in the south, the humbler kirk in the north.

To suppose that the Danes civilised Britain involves a reversal of ordinary experience, for Roman civilisation tamed the rude invaders of the imperial city when it underwent a change of masters, but retained its influence amidst the new national combinations which followed the dissolutions of the empire; and the effects of four centuries of Roman influence in Britain would not readily disappear.

I have attempted to show on another occasion that the Angles and the Jutes were not Teutonic foreigners, but sections of the Keltic Britanni. The mythical story of their foreign origin is possibly to be ascribed in part to Danish influence.

Though the Danes do not appear to have made descents on South Britain until the latter part of the eighth century, British traders had doubtless visited their country, and so intercourse and the interchange of visitors was established; and thus when Bæda wrote, half a century earlier, the similarity between the names of the Jutes of Britain

and those of Jutland would doubtless suggest the idea of relationship, an idea which would be favoured by any Danes desirous of establishing themselves in Britain for trade or otherwise. Subsequent events tended to confirm this impression, which would give a less unpatriotic appearance to the self-seeking partisanship of those Thanes and other people who attached themselves to the invaders as opportunity offered.

The Anglians, being a more indigenous and homogeneous people than the Sacs, were consolidated at an earlier date than any of the Sacsan communities or states. The Sacsan seaboard was more open to foreign intrusion than that of the Angles, whilst their land frontier was bounded by the various Britanni, who scorned to join or be combined with the Sacs. Thus the southern and western part of the island was perpetually disturbed by strife between the different Sacsan states, and between those states and their British and Anglian neighbours.

Subsequently, the West Sacsans became paramount in the South, and established a temporary supremacy over the Anglians, but when they were worsted by the Danes and Anglians combined they were obliged to give back the Anglian territory, which under the dynastic sway of the Danes was called Danelagh, not because Danish laws were established, as the word law is now understood, but because Danish kings maintained law, or order, for the K. *lagh* signifies order, and not the rules by which the basis of order is defined.

The Romans appear to have governed some of their colonies, including Britain, pretty much as Hindostan is ruled in the present day, that is, native usages were allowed so long as they were not incompatible with Roman authority. The Jews were able to demand the release of Barabbas in conformity with one of their usages. In the Danelagh

there are to be found those ordinances and usages which had survived the revolutions of centuries; and they were retained by the Danes, and subsequently by the Normans, because they were congenial to the people, and not incompatible with the authority of the Danish or Norman sovereigns.

In the Orkneys and Shetland, to this day, some of the same institutions exist as were found by the Danes in Anglia, though possibly in a less developed state; and instead of assuming that they were introduced from Scandinavia, I venture to think it more consistent with historic probability to suppose they were adopted by the Scandinavians, and carried by them from Britain. It does not appear that they left any traces in Ireland, whereas there are resemblances between the political and *quasi* municipal usages of Ireland and those of Britain.

All the people who bordered the German Ocean, or England's Sea, appear to have sprung from one source, and probably wherever they scattered themselves they carried the germs of the same institutions, which rendered it practicable to engraft any improved growth which had been acquired in other soil.

But to Roman and Christian influence must be ascribed that start in civilisation which rendered Britain a centre of intellectual progress and missionary zeal, and the wealthy prey to covetous and piratical conquerors, who enacted those scenes of rapine and wrong which were repeated by the Buccaneers of the Spanish Main, and the Filibusters of Western civilisation.

THE PHILOSOPHY OF THE FINE ARTS.

By THE REV. W. KENNEDY-MOORE.

ART is the expression of the beautiful in human works. The artistic element enters largely into many departments of toil and skill. Beauty may be studied in the fashioning of an implement or the cutting of a garment. In these cases, it is an adjunct to utility. The speciality of the fine arts is, that in them the production of the beautiful is the sole, or at least the principal, aim. In the old classification, the fine arts were reckoned as three, namely, Painting, Sculpture, and Architecture. Modern writers use the designation more freely, and include many others, the chief of which are Music and Poetry. It is in this wider sense that we shall treat of the subject before us.

The topics which naturally arise for consideration are these: The sentiment whence the fine arts flow; the mental faculty employed in the production of artistic forms; the relation of the several arts to each other; and their general bearing on human welfare.

In taking up these topics in order, we have first to deal with the theory of the Beautiful. And the question which meets us at the outset is this: Is the feeling of beauty a special and original sentiment, or may it be reduced to simpler constituents? I think it can be shown that no such resolution is possible; or, in other words, that the feeling of the beautiful is a separate and primary element in our nature. It has been attempted, indeed, by a very numerous school of philosophers, to make out that all the phenomena of mind may be traced back wholly and entirely to sensa-

tions. It has been laid down as an axiom, that nothing can exist in the intellect which did not previously exist in the senses. All the proof adduced for this sweeping assertion, under whatever parade of words or marshalling of distinctions it may be disguised, amounts simply to this : that sensations come first in the order of mental phenomena, and that without them no processes of thought could ever have been evoked. But the establishment of this position does not carry the conclusion that judgment and conscience are nothing but transmuted sensations. On the contrary, it may be clearly shown that in the very earliest dawn of knowledge, an intellectual element must be supplied by the mind itself. Mental phenomena may begin with sensations, but are assuredly not resolvable simply into them and nothing else. Whatever fascination this view may have from its appearance of profound analysis and splendid generalisation, it is only a specious and not a true philosophy. Sensations may be like the keys of the organ-board which evoke the splendid magnificence of its music ; but would it not be absurd to argue that there was nothing in the instrument but the keys alone? Setting aside the sweeping dictum, which would reduce the feeling of beauty with every thing else in the human mind to the mere level of sensation, we may enquire, on the principles of a more rational psychology, into the point at issue. On this standing ground also we may be convinced that there is an essential difference between mere sensation and the feeling of the Beautiful. We feel that many things are beautiful which are not objects of the senses at all, such as the solution of a mechanical or mathematical problem, or a certain exhibition of character. The fact is, that the feeling of the beautiful has an enormous range. At the lower end of the scale it may be hard to distinguish it from agreeable sensation, as in the case of a sweet sound or pleasing colours, while at the higher end it seems almost to merge itself into

moral approbation. If the feeling of beauty be not a sensation, simple or transmuted, can it be resolved into any other feelings of our nature? The association theory meets us here. According to this, those objects are beautiful to us which have been associated in our past experience with something pleasurable. The home where we have spent happy days is beautiful to us, simply and solely on that account. The faces wear a look of beauty which belong to those who have ministered to our happiness. Those objects are also judged beautiful which, though never seen before, yet remind us, by their likeness to what we have known, of such past happiness, or recall in any way the old emotions. Beauty, in short, is no quality *per se*, but the mere resultant of many varied and commingled feelings. It is astonishing how much skill has been employed in bolstering up a theory so essentially absurd. The endearing influence of association is a patent and familiar fact; but every one of us can perfectly distinguish between this and the proper feeling of the beautiful. We may prefer our humble cottage or moorland home, but we freely acknowledge that other mansions are more splendid, and other spots more lovely. We know that affection blinds the eye, but we also know that this is a folly. On the association theory, however, it could not be so; and the owl in *Æsop* was quite right who vaunted her hideous little owlets as the most charming creatures the sun had ever looked on. Another view of the nature of the beautiful is that which reduces it to the perception of utility; on this we do not need linger, as to state it is almost all that is requisite to refute it. Flowers have been always acknowledged to hold a chief place among objects of beauty, and yet few of them have any further use. I have never found any one who preferred the potatoe blossom to the rose, in consideration of the esculent qualities of the tubers. Without specifying any further theories, I think we may take it as

established that the feeling of the beautiful is a primary element in our nature. It is, so to speak, a kind of inward sense, as is indicated in the Greek word *esthesis*, and its derivatives.

Let us now go on to ask, Whether the element of judgment is included in our determinations concerning the beautiful? Is there an intellectual as well as an emotional side? This question runs up into the inquiry as to whether canons of beauty can be laid down—fixed rules, to which it is essential that artistic products should conform. Are there laws of beauty, or are there not? If there are, then it is evident that judgment must be called into exercise. It has been generally held that such laws do exist, and can be discovered and followed out. A well known proverb remarks, that there is no disputing about tastes. This may be true in so far as every man has a right to enjoy what he prefers, but it is not true in the meaning that all tastes are equally good. How, then, are such laws to be discovered and applied? They can only be derived in the first instance from experience; but when once found out, their application becomes a matter of science. To illustrate this, let us consider such rules as apply to what we may call the alphabet of art, that is, to the elements of sound, colour, and form, which are the vehicles of artistic expression. In regard to sound, for instance, what are the rules of harmony? What notes, when sounded together, please the ear? This can only be determined by experiment. No *a priori* reasoning on mathematical or physical principles would have been anything to the purpose. It is true that science has calculated the ratios of the rates of vibration between harmonic tones; but the fact of harmony had been discovered centuries before the calculations had been made. It is only through actual experience that the musical scale has been determined. Mere theory might have supposed that equidistant intervals

from note to note would have been the proper arrangement. The laws of harmony once discovered, however, they can be rigidly and scientifically applied. They become unquestioned canons in the musician's art. The same applies to harmony of colours. The rules for mingling and matching tints were known ages before the relative speed of the waves of different coloured rays of light had been investigated. Hence rules were laid down with regard to painting, which have remained fixed laws, and must ever continue so. It may be asked, however, whether in point of fact considerable diversity has not existed in regard to colouring. Do not the vulgar prefer loud contrasts and staring hues? Have not their preferences as good a right to the rank of rules of taste as those of any others? We answer, that the true rules are reached by the development of finer sensibilities. Finer minds first appreciate the more excellent way, and with the growth of culture others are brought up to the same standard. The truest rules prove themselves to be such by the permanence of their sway. They may be departed from in an age of vitiated taste, but they always reassert their paramount authority. Form, as well as colour, is an essential ingredient in the means employed by creative art. The same thoughts apply to the discovery of such contours and proportions as are most pleasing. Certain curves, for instance, have a remarkably fine effect, and are very grateful to the eye. It is very likely that some, if not all, of these are curves which have remarkable mathematical properties, such as the circle, the ellipse, and the parabola. But let us observe that their beauty to the eye has no necessary connection with their mathematical attributes. For all I know to the contrary, the most flowing and graceful of all lines may be one which cannot be formulated in any equation. Whether Hogarth's line of grace be the sweetest of all lines or not, can only be determined by an appeal to the sensitive

and practised eye, not by geometrical proof, nor by appeal to such an anatomical fact as that it exists in the human vertebral column. Many writers have resolved the beauty of curves into something suggestive, or symbolic. There is an element of truth in this, which I shall afterwards notice; but meanwhile I would point out that there is a beauty in them quite independent of every other consideration. In the shape of leaves, and in the form of vases, we have two familiar examples of an immense variety of curved outline, presenting an almost infinite variation in the degree of beauty as judged simply by the eye. Much the same may be said as to the comparative effect of different rectilineal figures. True it is that mathematical diagrams do not convey any vivid sense of beauty to the eye. These bare outlines must be filled out with substance and colour before we can judge of their effect. They must be transformed from thin pallid ghosts to living entities. Even then, it must be confessed that purely rectilineal forms cannot compete in effect with those which make use of curves. It may be shown, however, that certain combinations of straight lines ought to supply the frame-work on which more complicated forms are moulded, or the ideal boundary by which they are enclosed. It has been said, the most beautiful of such figures is a triangle of which the angles are respectively thirty, sixty, and ninety, that is, in the ratio of one, two, and three, and in which the longest side is double of the shortest—such a right-angled triangle as is produced when an equilateral triangle is bisected. It has been asserted that all the finest groups of statuary would be naturally enclosed by such a triangle, or by some of its derivative forms. It is said that in the finest paintings also, the principal points in the figures occupy the apices of such triangles as seen, however more or less in perspective. It is evident that this principle will apply also to the proper proportions to be

observed in the parts of a structure. Every one feels that in some buildings the proportions are much more pleasing than in others, constructed in exactly the same style. What the proper rules are for determining the most beautiful proportions, I shall not pretend to say. Different theories of calculation have been advocated. There is one, for instance, which deduces the length of all the lines employed from their position in regard to angles, which are selected as harmonic notes, as we may call them, in a scale of angular openings. To discuss these questions fully would require far more time than we have at command ; but the idea on which I am insisting in this part of the Paper is simply, that there is an alphabet of beauty in regard to sounds, colours, and forms ; that the letters of this alphabet have to be discovered by experiment, but when once discovered form principles which may be scientifically stated and enforced. Such are the principles that lie at the foundation of the musician's art, the painter's, and the architect's.

There is one element more which may be included in the alphabet of art—this is motion. We feel instinctively that certain movements are much more graceful than others. Unfortunately, however, it is impossible to construct works for the express purpose of showing forth artistic genius in permanent forms of motion. The only art, perhaps, if we can call it by that name, to which the study of graceful movement has given rise, is that of dancing. The popularity of it, as a spectacle, apart from whatever exhilaration may arise from its exercise, may serve to prove that in all lands and ages a source of pleasure has been found in beholding pleasing movement. That part of the orator's art which pertains to attitude and action falls under the same category. But although special developments of the beautiful from the element of motion are so scanty, there is, perhaps, nearly as much pleasure derived from the abund-

ance of this element in nature as from colour or sound. The graceful movement of animals, the natural attitudes of children, even the motion of inanimate objects, such as the ship, which "walks the waters like a thing of life," minister perpetual gratification to the sensitive eye, and perhaps in the evolutions of an army it reaches its most impressive form.

We have considered so far the primary rules by which beautiful elements may be selected, and those of a contrary sort cast aside. We have only come, however, to the very threshold of the subject. Art must be something more than the random use of the elements of beauty. It must have specific creations, instinct with special thought. To play simply the harmonic chords would not be music. To mingle well matched colours would not be painting, any more than merely to talk grammar would be the same as talking sense. In advancing a step further, let us look more carefully, in the first instance, to painting and sculpture. These have been called imitative arts, because they reproduce the likeness of somewhat which exists in Nature. Two elements enter into the enjoyment of such an artistic product. One is, admiration of the skill by which the difficulties of execution have been mastered. The other is, enjoyment of the proper beauty seen to exist in the work. The first element is not by any means to be despised. It may, however, be carried too far. It is a vulgar taste that is only gratified by the difficulty of the task accomplished—the taste which spoils the music of our best players—the taste which leads the staring multitude to gaze at those acrobatic performances which are disgusting and sickening to those of finer sensibilities. In painting, a good deal of latitude may be allowed, and pictures admired for the fidelity of the representation, without consideration of the beauty of the object copied. It is a higher thing, however, to choose, and

to produce, what is truly beautiful. In regard to imitation also, it may be observed that its artistic excellence lies in the most striking reproduction of whatever may be the highest characteristics of the object that supplies the model. We see this at once in the case of a portrait. The character of the man as it appears in the features should live on the canvas. Where this is lacking, no reproduction of his complexion, or even the lineaments of his countenance, will be satisfactory. The same truth applies, however, to paintings of the lower animals, and even of what we call inanimate nature. The character of a dog may be shown as perfectly in his attitude and look as that of a man; and even things without life have a life after all. In painting mountain scenery, the spirit of the mountains should inspire the brush. Their gigantic strength and solemn stillness, with their etherealising surroundings of shrouding mist or calm far-up sunshine, should speak to the spectator's soul. The works of the great masters are stamped with these revealings of Nature's inner spirit. They may coexist with very varied powers of minute delineation. Microscopic handling may have its place and charm, but is not, after all, the most faithful interpretation of Nature's aspects.

We come here on the vexed question between realism and idealism in art. Let us look at it in regard to one specific case, and for this purpose let us select the human body. To us, at least, this well-knit frame of ours presents the most signal illustration of beauty. Painting, and especially sculpture, find in it the best material on which to exercise their skill. How shall they best succeed? It certainly is needful first to become accurately acquainted with what they have to deal with. Great masters, like Michael Angelo, have not shrunk from bestowing unwearied pains on anatomical studies. Such give a force and fulness of meaning to everything seen by the eye.

The proportion of parts, the tapering of limbs, the curving and flow of contours, and, above all, fleeting expressions of countenance, can be most sharply understood by the skilled anatomist.

All such knowledge having been gained, as also all manual skill in handling of materials, how is the artist to set to work? Let us suppose him to be engaged to produce a likeness of some individual, a portrait, or, still better, a statue in bronze or marble. It is evident that two such statues may both be thoroughly faithful to the personal characteristics of the model, and yet differ very much indeed in their excellence as works of art. One may be heavy in attitude and feeble in expression, while the other may be full of grace and dignity, and convey at the same time a most vivid conception of the real character. Two different points evidently require to be mastered to produce such a work. One is a knowledge of expression, and the other a knowledge of the elements of beauty as applicable to the human face and figure. The first of these will show itself in the fidelity, and the other in the beauty, of the statue; and such a work may, I think, fairly be said to be touched with the ideal. Unless the eye of the artist could look beyond the merely visual, he could never succeed in producing it.

Let us next suppose that the statue is to be of an imaginary personage, such as a mythological deity was to the Greeks; or an allegorical being, such as Peace or Liberty, may be to ourselves. We may suppose the sculptor's aim would be to produce the most beautiful figure he could. Supposing he could find no one so absolutely perfect as to furnish a complete model, what would he have to do? Would it not be to arrive at a definite conception of such a perfect figure? This could only be done by taking a number of living examples, and finding to what they all more or less

tended. Granted that every one came short in some particular, it yet might be seen what the archetypal form must be after which they were moulded. Thus from the curvature of many small arcs, the centre may be determined. Possibly the finest artist's finest conception may yet come short in something. The *beau idéal* may never yet have been shown in marble, nor revealed itself to the most gifted eye in its most ecstatic moment; but still it is the striving after it, and some dim conception of it, that must lie at the root of every splendid work of art.

The same thoughts apply to historical painting, only here the knowledge of expression, both of character and passions, needs to be very strongly developed. On multitudes of canvases, figures are portrayed in which a master in the science of human nature would discern at once the grossest inconsistency, between the *personnel* of the actors and the deed in which they are supposed to play a part. I may be allowed to express the doubt as to whether, in this respect, historical painting has ever reached the point of excellence attained to by the sculptor's shapes of ideal beauty.

The idealising of some in our own time simply produces monsters. A warrior, for instance, who of course must have been a man of action, is represented with such an enormous forehead, under the delusion of giving him a noble look, that it is painfully suggestive of a very severe dropsical affection of the brain. Such idealising as this is worse than none.

The points I have dwelt on so far are these two. First, that certain primary laws may be discovered by experience, in regard to the appropriate elements fitted to be wrought up into artistic products; and, secondly, that in regard to the imitative arts of painting and sculpture, a knowledge of the elements of beauty may be so linked with fidelity of representation as to produce a more perfect form than may

possibly exist in nature. I go on to remark that the interpretation of artistic forms depends a good deal upon our knowledge.

Meanings become attached to certain forms simply from our acquaintance with certain laws or facts. A recognition of this will preserve us from fantastic theories and false generalisations. It has been argued, for instance, that straight lines convey the idea of strength, and curved lines that of weakness. But this is by no means uniformly true. It all depends on the physical relations of the objects represented. Rigid bodies have certainly rectilineal boundaries, and in their case straightness and strength go together, as on the contrary the pliancy of an osier contrasts with the uprightness of a pillar. But to show that this association of attribute with form is only partial, we have merely to think on the one hand of the straight lines formed by visible rays of light in which there is no expression of force, and on the other hand of the use of the arch, in which from our knowledge of physics we recognise a far greater expression of strength than in the horizontal lintel. It is especially when authors begin to assign recondite reasons for æsthetic effects that they go most astray. In one work, for instance, on the philosophy of the beautiful, it is first gravely asserted that the straight line conveys the idea of infinity, and the curve that of limitation, although this is in direct contradiction to the well known use of the circle as the emblem of eternity. But the application made of this theory is still more remarkable. It is asserted that representations of divine or heroic characters should as nearly as possible approach the perpendicular in general attitude and bearing, because equity was the moral quality into which the idea of infinity most intimately entered. On the other hand, when affectionate characters were represented, flowing curves were to be largely employed, because love was the finite element in morals.

The artistic rule here given may possibly be true ; but the moral theory connected with it will not be readily admitted. That justice should be the infinite, and love the finite, element in character, is a proposition that has no basis either in philosophy or Christianity.

Transcendental theories of this sort are of very little value. They are fascinating at first sight, but misleading in the end. Such is the theory of a recent celebrated French philosopher, who holds that all kinds of beauty are resolvable into one, namely, moral beauty. Physical loveliness is so only because of the moral element perceived in it. This view is opposed to the consciousness of every unbiassed mind. We know that we daily judge of the beauty of objects without the remotest reference to moral qualities. A lady does not choose her china because it is more suggestive of sanctity, or her jewelery because the shape or brilliance recommend courage or courtesy. Not only so, but we recognise the alliance of physical beauty with moral deformity. When we admire the glossy hide and rich streaking of the tiger, we yet hate its cunning and cruel nature.

Another theory has been advanced, that beauty is simply the recognition by us of the Divine Presence. God is the source of all beauty, and we feel its charm in so far as we recognise its source. A view like this may be pardoned when put by a poet, as it would not then be intended to be taken literally. It is quite true that in all beauty, as in all the other wonders of the Universe, we have an out-flow from the Great Creator ; but it does not follow that the feeling of beauty is nothing but the recognition of His Presence. We might as well argue that every other science might be reduced to the same thing. When children are pleased with flowers, it is simply because of the impressions the flowers themselves make on their tender little minds, and not for any other reason whatever.

It is true that a symbolism enters largely into our appreciation of the beautiful. Things become significant and moving by reason of moral meanings attached to them. Colours thus speak of qualities. Light and darkness become expressive of spiritual conditions. Particular objects become associated through legend or history with the deeper phenomena of human life. Art, of course, employs these symbols, but it is not well to use them too largely. Possibly the whole world and everything in it may be shadows of an unseen and nobler world of spiritual verities; but if so, we have not yet attained to such a comprehension of it; and as matters actually stand, Art must confine herself to somewhat humbler tasks than striving to make each earthly thing but a shadow of something heavenly.

So far may suffice for the significance of Art.

We have not yet touched on the rules of composition which must regulate every product of the creative imagination. Each one of the fine arts has special laws of its own in this respect. Such laws in painting, for instance, as relate to the grouping of figures on a canvas, or such rules in music as determine the structure of a sonata. These special rules almost seem contradictory. The set symmetry, for instance, needful in architecture, would be altogether out of place in painting. There are general rules, however, applicable to all the arts; such as this, for instance, that the particular effect aimed at should be within the proper compass of the art employed. The chief of these rules is that which demands unity in every artistic product. A true work of art should aim at such perfection in the proportion, purpose, and bearing of all its parts, that however diversified these may be in themselves, they should all coalesce in producing one great harmonious impression. A work of art is perfect, when not a touch could be added, and not a tittle could be subtracted, without marring the full

effect. It must be complete in itself, finished, and unchangeable.

Having dwelt so far on the theory of the beautiful, we may turn our attention briefly to that faculty of imagination by which works of art are called into being. The etymology of the word indicates that it is the power by which images are formed in the mind. In the language of science, however, the power of reproducing perceptions is not indicated by that term. When the conception brings with it the consciousness that we are reproducing a former state of consciousness, it falls under the head of memory. Apart from that reference to past experience, it is simple conception. The concepts of the mind are usually more or less general, that is, abstracted from the accident of any one individual perception. Almost all the words we employ are general terms, showing that the great mass of our ideas are general also. Of course, the degree of abstraction differs very much in different classes of words. A far higher degree of this process was requisite to obtain the idea expressed by the word *being*, for instance, than was needful for the word *man*.

The process of abstraction is in reality one of analysis, sometimes more partial, sometimes more complete. Analysis naturally leads to synthesis. A resolution into constituent elements prepares the way for new combinations. This truth, which holds good in the realm of physics, applies equally to the domain of mental phenomena. It is to this power of creating new mental compounds the term imagination is more specially limited. It is, in short, the creative faculty. The elements on which it works are such conceptions as have flowed into the mind through other channels, and which the analytic faculty has more or less decomposed. All men possess imagination in some

degree. The driest mathematician or most intolerable bore has something of it, although it may be hard to think so when the one overwhelms us with irrational surds, and the other makes life a weariness with his intolerable prosing.

It would not be hard to show that all scientific progress, whether in discovery or invention, requires a special development of imaginative power. The faculty of forming hypotheses lies at the root of all advancement.

Without entering, however, on this larger question, let us endeavour to get a glimpse into the special character and working of the artistic mind. One primal essential to such is great vividness of conception. The impressions made by the outer world are remarkably glowing. One man looking on a scene may behold it with far greater sharpness than another. Putting out of view any physical difference in the eyes, this may flow from habits of attention produced by training. A sailor on watch sees far more than the casual passenger who walks the deck. The Red Indian could follow tracks utterly invisible to the white man's eye. But where there is no such special training a difference still exists in the vividness of external impressions, due to the natural conformation of the mind. The brightness of a sunny day streams into some men's souls. A flower paints itself on the very mind as a thing of joy and glory. The reason of this lies in the superior degree of æsthetic emotion. It is the power of feeling keenly the presence of the beautiful that renders the mind so sensitive that it becomes like a photographic plate, retaining abiding pictures of those objects which to other minds but cast their passing shadows on the wall. It is evident that such vivid impressions would naturally reproduce themselves in proportionally vivid conceptions. Not only would such come in brightness when they came, but they would be sure to come very often. In short, they would haunt the mind. The element of

emotion is the master-power in suggestion. We are sure to be thinking constantly of what we feel deeply.

Some minds are more fertile than others. Where the suggestive faculty exists in strength, the presence of a vivid conception is sure to bring up a vast array of related ideas. They seem to live, move, and act before the inward eye. These ideas will not be merely pictures or images, but will include thoughts of every sort, according to the character of the particular mind. These are the elements from which artistic products are evolved. To reach this consummation, something more is needed than great fertility of fancy. There must be a certain unifying power. Rich materials are not sufficient without constructive skill. In great genius both elements co-exist. There may be no formal acquaintance with æsthetic laws, but there is a deep-seated instinctive knowledge of them. The man of creative faculty does not go to work in cold methodical fashion, ranging his conceptions, analysing them, and forming them into new compounds, like a chemist in his laboratory. Anything so produced would be utterly destitute of life and charm. It is when his soul is all a-glow that some vital germ of thought clothes itself in appropriate warm and breathing body, and starts almost as instantly into perfect life,—in his ideal world at least,—as Minerva sprang in full strength and beauty from the brain of Jove.

In larger works of art, the parts have to be completed with perpetual reference to the central idea. To accomplish this a sound judgment is eminently needful. But in the most inspired moments, when the work seems to shape itself by spontaneous impulse, as if the soul were merely a channel through which a torrent rushed from some higher source, even then the faculty of judgment mingles with all, and shapes and controls the form in its most rapid evolution. When the chariot dashes at headlong speed after

the fiery coursers, the hand of the charioteer still guides their seeming frantic course.

A splendid work of art has often been produced as if thrown off the hand. Thus Beethoven wrote some of his sonatas, and Byron some of his poems. But even where a long time has been needed to give completeness and finish to the product, the conception of it has revealed itself in the soul in sudden full-formed beauty.

I would only remark further, that imagination often shows itself in highest force where there is least of imagery. Not only pictures derived from the senses, but the profoundest intellectual products and weightiest moral truths, lie within the grasp of its creative hand. The most moving lines and lyrics poets have ever written have risen superior to all sparklings of a brilliant fancy, and in their severe simplicity have shown a nobler touch, and spoken more powerfully to the heart.

I shall now glance very briefly on the respective capabilities of the principal arts, comparing them with each other, in regard to the range of means they are able to employ, and the effects they can produce. To begin with Architecture; this can hardly be considered a fine art, pure and simple; by which, I mean that it does not aim solely at the production of the beautiful. It is true that architecture may be distinguished from building, inasmuch as the latter attends merely to construction without reference to beauty, while the former does make beauty its principal object. But in spite of this distinction, the fact remains that architecture must perpetually adapt itself to constructive necessities. Edifices are not erected merely as objects of beauty, or, if they are, they are pretty sure to be of very inferior sort. The greatest triumphs of architecture are achieved in structures dedicated to the most important public uses. The effect of such

master-buildings is extremely powerful on the eye and soul. The impression of solemn grandeur produced by cathedrals is wonderfully pleasing. Whether it be the rich masses of tracery in the Gothic style, or the soaring dome of Italian art, the soul must be chill indeed that does not confess their charm. The importance of architecture arises further from the permanence and publicity of its works. They speak to the eyes of countless multitudes through the long reach of centuries.

Sculpture is more a simple art, in the sense of being less bound by extraneous conditions. Its principal use among modern nations is monumental and historical—for the statue and the tomb. The generous desire to perpetuate the memory of the departed great finds in this art its favourite channel of expression. The permanence of its products supplies the required element of endurance, and the very difficulty of the materials employed lends a charm to the completed work. It is a sign of true nobility in a nation when they show anxious care to preserve the likeness of their worthies in breathing brass or speaking marble. These should, I think, be placed side by side in some great public hall, where they might always be seen to advantage, away from the turmoil of the public street, the dust and dirt and rain. What earthly use can it be to put the statue of Wellington on the giddy top of a column, so high that no one can see his features? Yet even this is better than the horrid barbarism of the skeleton clutching at Nelson's heart, as it may be seen any day on the Exchange flags, the effect of which is utterly repulsive, and jars with every finer feeling that might be aroused by the bravery and death of Britain's greatest admiral.

Ideal sculpture has but little place among ourselves. For models of it we have to go to Greece or Italy. The feeling of our people is opposed to much that would fall

under this category. Nor do I think myself that this feeling is to be blamed. The ideal figures our sculptors produce are chiefly allegorical, and are used as adjuncts to the principal figure in a group of statuary, or appear in monumental art. Many of these are eminently beautiful, in drapery, attitude, and feature. Sculpture has more of human interest in it than architecture, and is consequently able to excite more varied and keener emotion. I must confess for my own part, however, that sculptured forms do not appeal to my sensibilities very keenly. I do not feel any capability of passing through such an experience as Heinrich Heine, the poet, tells of himself. When he went to Rome, he took up his quarters in a villa, in the garden of which he found lying in the grass an overturned marble goddess. When he awoke that night, the thought of the white figure lying out there in its cold beauty came to him, and he vowed, "In the morning I will go and kiss thee, thou lovely one, on the side of the mouth, just where the smile passes into the cheek." He slept, and awoke again; the moonlight was streaming in bright glory. Again the image of the fallen goddess came before him. "I will rise and kiss thee this very moment," said he; and out he went, and pressed his warm lips to the cold marble that sent a strange thrill through all his frame.

Painting is a richer art than sculpture. Its materials are less costly and more easily handled than bronze or marble; but it has more means of command, and a far wider range of appropriate subject. It excels sculpture in employing colour as well as form, which far more than compensates for the fact that form cannot be so fully represented. Painting can represent every kind of visible beauty. While sculpture is confined to figures, the glories of sky and sea, of mountains and woods, can be pictured on the canvas.

When we think of the extraordinary genius that has been displayed in landscape-painting, we cannot but acknowledge the vast resources by which this pleasing art can minister to our enjoyment. Even the concomitants and surroundings of human life can be represented by the brush, as they cannot be by the chisel. And, in regard to the figures themselves, colour imparts a living look, which the pale statue cannot match. I do not know if it is so with others, but for myself I seem to know a man far better from his portrait than from his statue. Painting, again, can give expression, as sculpture cannot. Attitudes can be portrayed, which cannot be carved. The statue must preserve a certain decorum, so to speak, which prevents the expression of passion and vehemence. Even in the features, there must be less contortion. True it is that sculptors have sometimes endeavoured to push their art beyond the limits of this rule ; but it has been justly held that in so doing they fell into a debased and exaggerated style. The finest statues in the world are characterised by repose, or by such feeling as does not much disturb the prevailing serenity. Sculpture may best reproduce the physical beauty of the frame, but painting best speaks the soul. From its power of presenting groups, painting can also make actions, as it were, take place before our eyes, and thus speak a story which may be full of meaning. Hence it has great power of teaching, as well as of touching our sensibilities. Many a picture is a sermon, taken in at a single look, and not easily forgotten. I said above that I was not much moved by statues, but, on the other hand, I have often felt most keenly the pathos of pictures.

From painting, we may pass on to a very different art, that of Music. The element employed is utterly diverse, being sound, and not form or colour. The pleasure produced

by music is quite peculiar, and may be enjoyed very largely without reference to anything else. In this the combinations of sound have a great advantage over combinations of colour. In the ornamental arts, indeed, mere colour patterns can be used with pleasing effect. But, speaking generally, colour must be used to convey the idea of something beyond itself. The same rule does not apply in music. Melody and harmony are sufficient in themselves to constitute artistic products. While this is an advantage in one sense, it is a disadvantage in another, inasmuch as it tends to dissociate music from other parts of our nature. The dissociation is only partial, however. Music has a strong alliance with our emotions, little or none with our ideas. Its access to the seat of emotion is indeed of a very direct and immediate sort. Painting produces emotion by presenting an idea which excites it; but music evokes the feeling without the intervention of an idea at all. A painting of a maiden, weeping over her dead lover, would make us feel sad through our sympathy with the tale of sorrow. But a plaintive strain in a minor key would sadden us without any conception being placed before the mind. If it be asked, Does music not then convey ideas? I should answer, No. Not directly, but indirectly, it may. It quickens emotion, and the emotion may clothe itself with conceptions. In imaginative minds it is sure to do so. Thus Burns' Scottish songs may be said to have been inspired by the strains of his native music. I fancy, however, that most musical people rest merely in the music, and do not rise to any counterpart of it in appropriate imaginings. It is true that most of the fine music we hear comes to us associated with definite ideas; but these do not flow from the music itself, but from the words to which it is wedded. The music raises feeling, and the words interpret it into thought. Where words are wanting, as in

the symphony or sonata, an attempt is sometimes made to produce a state of feeling such as might exist under the influence of other natural influences. It is only thus, in this dim and far-off fashion, that springtime or moonlight can be represented on a composer's score.

If we include Poetry, according to modern practice, in the list of fine arts, it is undoubtedly the greatest of them all. Its alliance is more intimate with painting and music, and it may be said to stand at once between them and above them. Words are the means which it employs, and in the use of these the elements of sound and meaning have both to be attended to. In so far as sound is concerned, poetry approaches music. Melody is an essential part of the poet's art; although it does not tell on the ear in the same way or to the same extent as music does. Yet there is a marvellous charm in the sweetness of a poet's numbers. While in music, however, sound is everything, in poetry it holds but a subsidiary place. Words may be chosen partly for their sweetness, but very much more for their meaning. As compared with painting, poetry comes short both in vividness and in instantaneousness of presentation. Words can only set forth a scene part by part, and not as a whole, to be taken in at a glance. Neither can words, to most minds at least, paint with such glowing effect as colours on a canvas. Where, then, lies the supremacy of Poetry? How should she sit on the throne among her sister arts? Because her range is so wide as to include every thing man can know or feel. No other art can present truth in all its force, and reach, and depth, as poetry can do. There is nothing in nature or in human life, nothing in ripest science or loftiest speculation, which she cannot touch with her magic finger. She can address herself to man's intellect and imagination, to his conscience and his heart. Even in telling a story, if

she cannot do it with the instantaneous effect of painting, she has the far greater advantage of relating it in fulness of detail, and all the steps of progress. The emotion she awakes is deeper and far more abiding than that kindled by music. The one passes with the sound, the other remains indissolubly bound to the idea lodged in the mind. The poetry of the human race is the essence of all its noblest thoughts, sweetest affections, and deepest seated feelings.

I shall conclude this Paper by touching slightly on the influence of art on human welfare. It is evidently a very abundant spring of enjoyment, co-extensive with our race. The very savage carves his bit of wood into some grotesque shape, and blows some rough music from his wreathed shell. The progress of the fine arts is a just criterion to mark the advance of civilisation. However much some former ages may have come short of ours in material appliances for comfort, we yet must rank them high when judged by a nobler standard. Greece in her palmy days, and Italy in the middle ages, were very highly civilised, though they might not have enjoyed such commodities of life as have fallen to our lot. Even the poorest among ourselves may draw enjoyment from art in some of its humbler forms—the cheap print on the cottage wall, the quaint ornaments on the mantel-piece, the pattern of the china, the pictures in the family Bible. These cultivate a love of neatness and beauty, shown also in such little things as the culture of flowers, and which adds much to the amenities of the humblest home, and gilds with a ray of sunshine the poorest lot. We notice thus the influence of art on moral well-being. In supplying better joys, it tends to wean us from all dangerous pleasures. By refining the character, it makes grossness more repulsive. We have therefore reason for congratulation in the growing diffusion

of artistic taste in our time among the humbler classes, by means of the illustrated press, and the opening of art-galleries and schools of design.

The influence of art on morals, however, may be over-rated. It is at best but a subsidiary adjunct. Moral character is founded on convictions, not on tastes. *Æsthetic* emotions are mere sand, which cannot sustain so great a structure. If we build not on the rock of conscience, we are sure to fail. The truth is, that while the natural alliance of the beautiful is with the good, it can yet enter very freely into very friendly relations with the evil. The charms of art have been prostituted only too frequently to the service of sin. Even too great devotion to the cultivation of better forms of art is apt to indicate a degeneracy of national spirit. The age of Pericles was the most brilliant Athens knew, but not the most noble. Augustus found Rome a city of brick, and left it a city of marble; but while the world's capital was passing through this splendid transformation, the old Roman virtue, freedom, and honour were utterly dying out.

Moral greatness is a mighty growth, out of a deep and rugged root, and art can do little more than supply the finish of beautiful and fragrant flowers. This leads us on to ask, How is art related to religion? The alliance of the two has been remarkably conspicuous and persistent. May we not venture to say that all the noblest products of art have been consecrated to religious service? The most remarkable remains of the ancient world are temples; hewn out of the rock in Judea, standing in colossal ruins beside the Nile, in sweeter shapes crowning the hills of Greece, or rising in solemn vastness out of the noisy life of modern Rome.

Christianity, no less than many-formed heathenism, has its great array of architectural marvels, from the domed greatness of St. Peter's, downwards. Sculpture and painting,

no less than architecture, have wrought their master-pieces for sacred uses, the one in heathen, and the other in Christian times. Pictured Madonnas and martyrs, the miracles and the passion, have supplanted the marble statues of gods and goddesses. Above all, music has been the chosen ally to religious rites, from Miriam's timbrel down to "the storm our high-built organs blow." How far has this alliance with art been serviceable to religion? It has been a mischief, or a good, mainly as it gave force to falsehood or to truth. Art embodies a creed in striking and palpable shapes, which tell powerfully on the popular mind. Unfortunately, it has tended too much to materialise religion, to substitute the sensible for the spiritual. It has done far more for idolatry than for a better faith. In alliance with that purer faith, it may still do harm, where too much leaned on, where æsthetic emotions take the place of proper religious feeling. If it be true of morality, as we have asserted above, that it is too mighty a growth to derive much support from æsthetic sources, much more is this true of spiritual religion. This draws its life from the central heart, something far deeper than the sentiment of the beautiful. The most fervent and devoted have scorned the aid of any such poor accessory. The Covenanters meeting on the moor, while the storm rattled and the lightning flashed; the Puritans waking the echoes of the wild shore and ancient forests with strange words of prayer.

The religion of a people must be cultivated by its own appropriate means, and guided in its own proper channels. Where this first and all essential requisite is attended to, Art may be safely used to supply her quota of aid and service. Her charms may be added to the proper glories of religion itself. Music especially seems peculiarly fitted to serve as handmaid in the temple courts. She gives melodious expression to the emotions of the heart, and adds her

charm to the sweetness of the sweetest themes. The idea of beatitude is peculiarly associated with that of music, and Heaven peals with everlasting anthems. The sentiment of the beautiful has its place in religion also, as running up at last into the idea of the supremely good. In the contemplation of infinite excellence, that sentiment reaches its most exalted strain.

Thus we see how the various parts of our nature have been framed to act in unison. It were indeed a libel on our Creator to think that it were otherwise. Discord only arises from some fault, some defect, some misuse. But the intention is for the Beautiful to follow the True, and for both to lead up to, sustain, and adorn the Good. Such is the proper and natural alliance of Science, Art, and Religion.

SEMITIC LEGENDS.

By BARON L. BENAS. .

THE more cultivated a people become, the more they venerate legends of olden time; not that they accept their utterances as truthful. The very term Legend draws a very broad line between it and History; yet from the origin of recorded time until this day mankind are apt to accept tales and phrases of their heroes and heroines which, if not actually vouched by historic fact, yet from surrounding circumstances lead to the belief that the words are suited to the characters of the persons who are connected with them. Thus "L'état c'est moi" has been put into the mouth of Louis XIV. "Soldiers, thirty centuries look down upon you," are given as the words of Napoleon at the Pyramids. Nelson is supposed to have uttered, "A peerage, or Westminster Abbey"; and Wellington himself never recollected to have exclaimed, "Up, Guards, and at them!" Even the beautiful episode of Highland Jessie at Lucknow, it is very much to be feared, is quite mythical. Thus we see that even at comparatively recent periods legendic creepers have wound themselves round the truthful trunk of history; and yet it is hinted in many quarters, and especially in the Encyclopædic school of French masters, that when legends ceased civilisation began.

No phrase is more frivolously used than the word "civilisation." We talk of civilised peoples, civilised states, civilised cities, civilised men, and civilised manners, and yet it is the most difficult task for the historian or archæologist to point out when civilisation really commenced.

Was Egypt, was Assyria, were Babylon, Palestine, Greece, or Rome civilised? Were Mexico and Peru civilised nations? Is civilisation the self-denial of the many for the benefit of the many? Is it the clustering of human beings in a given radius? Is it the toning down of the brutal instincts of the animal, and the raising up the level of humanity to the model of the ideal? If so, what is the ideal? And is there one ideal, or are there many ideals? And does the conflict of ideals produce harmony, or is there but one ideal only?

We find in nature the tree, the shrub, the flower, clumps and grasses; there are fields and fens, rock and hill and dale; the brook, the river, and the ocean. A combination of all these objects in nature we call a beautiful landscape. We go to the desert, and find an interminable sameness, a vista of sand without end, without variety, an eternity of equality, and we call it a wilderness. It seems, then, we call an eternal oneness and endless repetition, a continued and unceasing multiplication of one and the same matter, a wilderness or a wilderness.

What do we term harmony in music? Is it the eternal braying of a horn, or the continued strumming of a string, or the ceaseless beating of a drum? We call this discord. The combination of the reed, the string, the horn, the drum, — the blending of sounds each differing in itself, but all working under a single conductor for the same results, — produces what we term sweet sound and harmony.

Is it one people alone, then, that contributes to the civilisation of mankind; or the many, each working in that particular sphere to which it was best adapted by the Creator of Nature?

Now it has been the habitual tendency of writers and thinkers of various schools of thought totally to ignore the claims of Semitic literature and culture as one of the

workers in the cause of the education of mankind. The monastic authors knew nothing of Semiticism, except that which they obtained through the medium of the Greek and Latin writers, whilst the Voltarian and Encyclopædic schools of literature looked upon Semiticism as a huge imposture from beginning to end, and vented their spleen upon that literature because they were the authors, they assert, of all that was antagonistic to true culture. Thus, like many great pioneers, Semiticism has seen its views adopted without its name being even recognised in the great work of culture, even as we now see the New World discovered by an indomitable perseverance, and brought to light by the brilliant genius of a Columbus, who is denied the just tribute which mankind might have awarded in naming the great continent after him. We find, however, in reality that whilst only a small district is named Columbia the whole continent goes down to futurity with the name of Amerigo, an obscure and undeserving stranger.

It is asserted, on the contrary, that Greece is the mother of all that is good and beautiful. Yet, it may be asked, was not Hellas beautiful? Indeed she was very beautiful. Her language was superb, her sculptures were unequalled, her paintings marvellous. No epic poem has excelled that of Homer. No lyrics are more charming than those of Pindar and Anacreon. No dramas are more soul-stirring than those of Æschylus, Sophocles, and Euripides; nor are there more interesting writers than Herodotus, Thucydides, and Xenophon. There is no orator even who has excelled Demosthenes.

Yet, I boldly assert, the world loves not Greece. I use the word "love" advisedly, in its purer and holier sense. We do certainly love Grecian poetry and Grecian art, as a youth might love a lascivious beauty; he may be enraptured with her wiles, intoxicated by her grace, and enslaved by her charms.

He might follow her from rock to rock, from hill to hill, to the very precipice of ruin, even to ruin itself, as with nymph of the Lurlei. The effect of Grecian literature upon the mind is like that of strong wine, that inflames the heart and causes the brain to swim; that transforms the dismal grotto to a cavern glistening with jewels; that transmutes ragged beggars into gorgeous princes; but, like wine, it leaves the lethargy of blank behind. There is no *true* virtue, no *true* fortitude, no *true* hope, no *true* resignation. Could any human being for a moment imagine that a Grecian Burns might write a Grecian *Cotter's Saturday Night*, where—

“The cheerfu’ supper done, wi’ serious face,
 They round the ingle form a circle wide;
 The sire turns o’er, wi’ patriarchal grace,
 The big ha’ Bible, ance his father’s pride.
 His bonnet rev’rently is laid aside,
 His lyart haffets wearing thin and bare;
 Those strains that once did sweet in Zion glide,
 He wales a portion with judicious care,
 And ‘Let us worship God!’ he says with solemn air.”

But the prose of this poem is that of a Northern family, brought up far away from those glowing scenes described in a sacred Semitic book, of a different race, with different habits and different propensities. When they are bowed down with the many toils, vexations, disappointments and privations that a day brings forth, they read for their consolation and mental refreshment an oriental book written by Semites, written for Semites, and principally describing the action and lives of Semitic peasants, who were the actors in that drama, of which, though the stage was very small, the auditorium is the whole world.

May we not truthfully maintain that the love of mankind towards Semitic literature is a *true* and *healthy* one, whilst the love to Hellenic literature is, to say the least, a forced

and acquired love, and has not the healthful tendency of the former ?

“Medio de fonte leporum,
Surgit amari aliquid quod in ipsis floribus angat.”

It is asserted that both the Semite and the Greek received their knowledge from the Egyptian. This is a theory I shall not venture to enter upon, as it would open up a totally different subject from that which I propose bringing before you ; but it seems peculiar that in their social fabric they should reverse that system of architecture which is unique with them.

Whilst the pyramid is admitted to be the most solid form of building, in their social state the Egyptians did just the reverse ; they placed the base, or the people, upon the shoulders of Pharaoh ; thus the apex had to bear the whole weight of the social base. Pharaoh supported the people, not the people Pharaoh. We find this well exemplified in the history of Joseph, who as a statesman could only lead, not alter, the existing state of affairs.

What a powerful central government the Egyptian must have been to have enabled the people of that country to be transplanted from province to province by the mere will of a paternal ruler. In the social system, however, of the Palestine Semite this order was reversed—the base of the pyramid, or the people, rested upon the earth, whilst they placed the being they worshipped, and towards which all their laws tended, upon the apex or summit. Thus, whilst in the one nation nothing but the brick and stone remain, in the other the pyramid of a nation has remained almost intact, and with little change.

I do not believe that it is just to claim the inheritance of civilisation exclusively from either Egypt, the Holy Land,

Greece, or Rome; but I maintain that it is unjust, unfair, and even unwise, to be led away by popular error and prejudice, and to banish, despise, and treat with contumely a literature a portion of which is accepted by half the world as an infallible guide.

In the Session of 1869, I had the honour of reading before you an essay on Semitic Proverbs, and the indulgence which this Society has accorded to my feeble attempts to enter upon that somewhat unbeaten track, has caused me to venture upon bringing before you this evening a companion paper upon Semitic Legends.

Legend is to history what sunshine is to landscape; it alters nothing, it adds nothing, nor does it diminish anything; it levels no mountain, it raises no valley, but it illumines that which is obscured, and causes the very shadow to appear more beautiful by contrast. So folk-lore and legendary history please us, and we revel in the sunshine which is sometimes wanted to gild the stern truth of cold, implacable history. Our stories of Arthur and his valiant knights, of Alfred in the neatherd's cot, of Robin Hood and his merry men, we treasure as priceless gems; and yet who would dare to put the frigid touchstone of historic test upon these heirlooms? If we did so, like the bright coin we read of in the *Arabian Nights*, they might turn into withered leaves. On the contrary, it may be wise to retain them for what they are worth. The William Tell whom history is half afraid to own, is a living power to the brave mountaineers of Switzerland; and the Hamlet and Ophelia whom our immortal bard dragged perhaps from perpetual obscurity, have been reinstated by our Scandinavian brethren; the little craft that cross the Sound bear the lover's names, and the old castle of Elsinore is rehaunted by the ghost of the poor perturbed spirit.

There is an old Oriental proverb, "You can discover a well, but cannot make one." This applies with equal force to legends and folk-lore. Poets may adorn, artists may draw, and sculptors may chisel into beauty the faintest outline of a story, just as a single ray of light may be subdivided into a prism of variegated colour; but it may be doubted whether a legend can be circulated unless surrounding history lends a colour to its presence. It is because of this that legends are thus prized by the most critical and matter-of-fact peoples. Even the cold, philosophical German takes an extra whiff from his pipe, and thaws somewhat, before his beautiful legend of the Tannhäuser, and the Niebelungen. Indeed, the old legend of the Emperor Babarossa, who should slumber for a thousand years, and awake to find a united German Empire, has not done a little to fight the Teuton's battle for victory and independence.

The early legends which I propose bringing before you are extracted from various sources, but principally from those ponderous tomes known under the comprehensive term of Gemara and Midrashim.

One of the charges brought against these monuments of antiquity is the fact of their containing these very legends in the midst of the most serious discussions of legal technicalities. I will not attempt to deny this. It will, however, be fresh in the memory of every reading person that a celebrated suit took place some few years ago, known as the Saurin trial, when a religious lady sought damages for what she imagined was an illegal ejection from a convent. Now the very highest legal talent was employed by both litigants, and one of the most learned judges in Great Britain presided. Long and serious were the cross-examinations on

both sides, when suddenly a matter came forward for discussion before the court entirely foreign to the subject. Yet the judge, the counsel, and all the learned barristers in court, seriously gave their version of the point in dispute. Nay more, the public became interested in the matter, columns of the newspapers were filled with it, leading articles were framed upon it, and periodicals had reviews concerning it. And what was this all-absorbing, all-important matter? Oh, tell it not in Gath! Why, it was whether an old nursery rhyme—

“The king was in the parlour, counting out his money,
The queen was in the kitchen, eating bread and honey,”

was to be read thus; or whether it was—

“The king was in the counting-house, a counting o’er his money,
The queen was in the parlour, eating bread and honey.”

Now let it be remembered that this took place in the nineteenth century; and yet we throw stones on the sages of old for having a little banter on their own account some thousands of years ago.

I propose to bring under your notice a few of the legends of the early period of Semitic folk-lore. I need not add that they do not pretend to be any more than what they seem, mere fables. The first relates to Adam.*

“It was early on Friday morning that Adam woke up in Paradise, filled with that ambrosial delight which all men since have ever sought, and sought in vain—pure and unalloyed happiness. But when evening came, it brought not only darkness, but gloom of the soul, bitterness of heart, and darkness of the future. Adam had disobeyed; and now the angel, with fire and destructive sword, drove

* *Pirke Rabbi Eleazar*, chap. xix.

him and his companion into the wide, wide world of remorse, anguish, privation and bitter disappointment. But another heavenly being—the angel of the Sabbath-day—now began to hover benignantly over all created nature, and wept for mercy for the frail mortals. ‘Oh, Great Author of this orb!’ cried she, ‘let not this day, the day that Thou hast blessed, be the first of misery for all mankind. Oh, remember that these Thy creatures are but dust and ashes; and if not for their sakes, pardon them for this day only, for the sake of Thy eternal goodness.’ And the still small voice replied, ‘Thou hast not appealed in vain; I will remember thy pleading for ever unto eternity; and although for six days man shall labour with the sweat of his brow, if he will remember thy pleading he shall always have on thy day a portion of Paradise.’ Thus, since that period it is said, every one that observes the Sabbath properly has a reminiscence of what Paradise was, free from care, free from toil, nought but blissful and happy repose.”

Another old legend that I shall bring before you is one of Terah, the father of Abraham.* Terah was a very enthusiastic idol worshipper, and possibly was so from interested motives, as his occupation was that of a manufacturer of graven images; now Abraham, his son, did a great deal to ruin his father’s connection. One day, a very old man entered Terah’s studio, when Abraham said to him, “How is it possible that you, who count so many years, can worship a thing that is only one day old?” Whereupon the client withdrew, somewhat surprised by the young man’s logic. At another time, an old lady brought some fresh fruits to be laid at the feet of the gods in the workshop. This so irritated young Abraham that he took up a staff and demolished the whole of his father’s stock-in-trade.

* *Medrash Rabba*, Genesis xxxviii.

When Terah returned home, there was a terrible confusion in the house, and he asked what was the cause of all this ruin. Young Abraham replied, "Well, papa, an old lady brought some fruits to offer to the gods, but the big one with the staff in his hand wanted all to himself; the little deities would not stand this, so there was a revolt, and the big one came down upon them with his stick and smashed them all to pieces." "And am I to believe all this stuff and nonsense," asked Terah. "But," replied Abraham, "you do believe in all this nonsense." "What!" exclaimed Terah, in a terrible rage, to the youth, "do you dare to interfere in our vested rights and established institutions?" Thereupon the father handed his son over to Nimrod for chastisement. But Nimrod called Abraham kindly, and said, "Now, my child, you had better choose one of our deities for your patron, and let us be friends. I propose that you worship the fire." "I would imagine," replied Abraham, "that water were better, since water quenches fire." "Well, then, worship the water." "But, think you not," rejoined Abraham, "that the clouds were better, since the clouds give forth water?" "Well, be it the clouds." "But," again asked Abraham, "the wind disperses the clouds." "Well, worship the wind," growled Nimrod. "But I am thinking that man can so construct tenements that he can defy even the force of the wind; why not worship man?" Thereupon Nimrod, losing all patience, ordered Abraham to be cast into a fiery furnace; but Abraham, praying to his secret protector, remained unscathed in the flames; when Nimrod, somewhat cast down, said to Terah, "Go with thy son, and take him from hence, for he will unsettle the minds of all our inhabitants." Thus it was why Abraham left his birth-place, Ur Casdim, and journeyed to the Land of Canaan.

I select another of the many legends told of Abraham.* On a very sultry day the patriarch was seated at the door of his tent, when a very aged man passed by. Now Abraham was a very prince of hospitality, and at once asked the old man in to eat bread with him. Whereupon the stranger seized the food with avidity, but his host stopped him and said, "Dost thou not say grace to thy Creator?" "I know no Creator," replied the man! "Then instantly quit my roof; no such man can abide with me;" and he drove him from his tent. Whereupon an angry voice came to Abraham from above, saying, "Abraham, I have borne with this man ninety years, yet thou wouldst not bear with him ninety moments." Abraham ran after the old man to crave his pardon, but he was no more to be found. After this, the patriarch received all strangers, never asking them their mode of worship; he made a covenant even with Abimelech, and for this he was rewarded by a visit from angels, who promised and gave him a son in his old age.

The following legend relates how Moses came to have a difficulty of speech.

When Moses was adopted by the Princess of Egypt,† he speedily became a favourite with Pharaoh, who allowed the child to play beside him, even when he presided at the meetings of the Royal Council. At one of these assemblies, the little lad crept up the Royal Throne, played with Pharaoh's crown and toppled it over, so that it fell to the ground. This was deemed a bad omen, and three of the wisest men were summoned. These were Job, Balaam, and Jethro. Balaam pronounced the matter serious, and advised that the child should at once be killed; but Job and Jethro ascribed it to mere childishness, and desired the

* *Sabbath Meditations.* M. H. Bresslau.

† *Midrash Rabba*, Exodus ii.

king to take no notice of it. But Balaam, in order to prove this, advised the king to bring in two censers, one filled with gold, the other with burning coal; and if the child chose the gold it would prove that the infant possessed dangerous wisdom. Pharaoh assented to this, and the slave placed the two pans before the infant Moses. Job and Jethro prayed that Providence would save the child. Moses was just upon the point of touching the gold, when an invisible hand led him to the burning coals; one of these the child put into his mouth, and from that time Moses spoke with difficulty. Moses was saved and Balaam exiled. Job was the hero of that book which Moses wrote to commemorate his name, and Jethro, his other protector, became his future father-in-law.

I dare not attempt to relate a tithe of the legends that cling to the name of the great divine, statesman, and law-giver; but one other pretty legend, as to why he was chosen to perform his glorious work, is this: Whilst tending to the sheep,* which at that period was his usual occupation, there was a flock of many thousand moving before him, driven on by the shepherds; Moses perceived that a little lame lamb was left some distance behind, and ordered the shepherds at once to return for it; but they laughed at the idea of troubling themselves about so insignificant a creature, which, from their multitude, was, as a matter of worth, valueless. Upon seeing this, Moses himself went backward a mile or more, to fetch the little lame lamb, bound up its wound, and carried the creature in his arms until he reached a well, and there gave it drink until it was refreshed, and then could limp joyfully with the others. Providence, it is said, looked favourably upon this act, and decreed that he who would not forsake a poor worthless little lamb, would not be unfit to lead that flock which Heaven had sought out itself.

* *Medrash Rabba*, Exodus i.

A pretty legend is on record of King Solomon's daughter, Sulamith.* She was the prettiest, most pious, and wisest of that monarch's numerous progeny. One day, walking some distance from her maids, a lion came rushing towards her with terrible strides; a moment more and she was lost; when suddenly an arrow from an adjoining thicket pierced the brute to the heart, and the huge beast fell dead at the feet of the terrified princess, who had fainted away with fear. A fine strapping young captain of the Royal Guard, named Amnon, rushed forward to the fainting princess, and bathed her forehead with the cool water of a neighbouring spring. As would be very natural under the circumstances, a strong love at first sight sprang up between the youthful pair. The princess was never so happy as when she could exchange stolen glances with the beloved saviour of her life; but he, poor fellow, had very little hope, for he had nothing to offer the princess but his love. He was worldly poor, possessing nought but his uniform, his fine presence, and his honest sword. He confided his love to his mother, who told him that true love would win at last. The king knew of this attachment, but wished to ignore it. At a banquet some time after this, given to the officers of the Royal Body Guard, a conversation sprang up about the celebrated Ice Cavern situate near Jerusalem, which was supposed, from its continuous frost and its total darkness, to be the abode of an evil spirit. Suffice it to say that no human being ever entered that cavern, nor was it ever explored. Solomon called to his officers, and said, "This cavern must be examined; I desire to know its contents;" yet no soul replied. "My army," exclaimed the king, "must have sadly deteriorated. When my royal father, David, was athirst, and said, 'Oh that I could get a drop of fresh water from yon well,' thirty brave hearts cut their way through the

* *Sippurim Pascheles.*

Philistines and brought it to him. Where are these warriors now?" Still there was no reply. "Well," said the king, after this silence, "whoso explores the cavern, and remains three days therein, shall have to wife the Princess Sulamith." Up rose Amnon at the word. "My liege," cried the young captain, "I accept the royal offer." To the astonishment of his comrades, and all the people of Jerusalem, and more especially of the king himself, who thought by this means to rid himself of the aspirant youth, he returned safely, and ready to recount his adventures. He said that Nathan the prophet stood at the cavern mouth, and warned him not to enter; but, he said, that for love of the princess he was prepared for victory or death. "Nay, it shall be the former," said the prophet; "keep you a long distance from me and I will precede you with a torch; thus, with my aid, will you explore this abyss. Now my liege, I claim the princess." "I refuse," replied the king; "thou hast not fulfilled the conditions to the letter; the torch of the prophet Nathan has given thee the warmth that enabled thee to sustain the cold. Thou must do this task again without the flame." The princess and young Amnon were disconsolate; the young officer was fearful of tempting Providence once again, but the mother of the captain, knowing that the king delighted in a witty rebuke, resolved to try what a mother's love could accomplish for her son. She knew that the king walked every morning in the royal park, and at the usual hour she went thither, with a fowl, which she hung upon a spit, as if for roasting. At a very, very long distance she lit a torch, and sat unconcernedly turning the fowl. The king at length came nigh, and looked upon the strange proceedings of the woman. "What art thou doing?" inquired the king of her. "I am roasting this fowl, your majesty." "But you are foolish," replied the king; "the fowl can receive no heat from a torch so many

yards distant." "Aye," replied the woman; "if the king said that Amnon could get warmth in the Ice Cavern from a torch carried before him, why cannot this fowl?" "Who art thou, woman?" demanded the king. "I am Amnon's mother." "Woman," replied the king, "I am well rebuked. Amnon shall marry my daughter, the princess;" and tradition states that never was such a joyous time for the people in Jerusalem as on the day when the loving pair went to be joined in wedlock. His memory the people for many ages ever revered, for he strove to ameliorate their condition, and to shield them from the heavy taxes which Solomon from time to time imposed upon his people.

Quite a number of legends are connected with the celebrated Queen of Sheba,* who visited King Solomon to see whether he was really as wise as his reputation. At a banquet, she caused some splendid bouquets to be hung among garlands suspended from one column to another. "Now, wise king," asked the royal lady, "tell me without approaching them which of these are real flowers and which are imitation." "There is only one single real bouquet among them all." The queen was wonder struck, and asked how it was possible that the king could have guessed this so well. "Very simply," replied the monarch; "the flies avoid them all, except the one; and, O queen, insects are as wise in their instinct even as King Solomon in his learning."

"What is that," asked the royal lady,—

"That the wind moves like waves;

"That praises Heaven with the priest;

"The want of which causes a blush to the poor;

"That follows all to the grave;

"Gives joy to the bird,

"But horror to the fishes?"

* *Targum* ii., *Esther* i.

The king replied thus: "When the wind bloweth upon the unmown flax, it surges like the billows of the main. In robes of spotless white, the priest give praise to Heaven. The poor do blush indeed when linen fails them; and the shroud is all that man retains of all his wealth. The bird nibbles at the seed with fond delight; and horror seizes the poor little fish when entangled by the net. Take then, O queen, thy spinning-wheel, use diligently thy flax, and leave the cares of state to those of sterner stuff."

A story is told* of some mariners, during a reign when maritime explorations were many and frequent, of a very large vessel that sailed a long distance without sighting land. At length an island came in sight, and all made for shore. The mariners were, however, divided into five parties; the first said, "We will not go ashore at all; we may be tempted to partake of that which is not good for us, and may have cause to regret it." The second party went ashore, remained a little while, tasted moderately of the fruits of the island, and soon returned and occupied their original places. The third party was so enchanted with the island, that they remained very long; a fair wind arose and they had to hasten to the ship, but found their places already occupied by other mariners, who were promoted to their positions. The fourth party became so madly enchanted with the pleasures afforded by the island, that they dallied, saying, "The sails are not up yet, and we need not hurry." At length the captain rung the ship's bell violently, when they bethought themselves once more, and, torn with the brambles and bruised with the stones in their path, in a fainting condition, they were at the last moment hauled up the ship's side. The fifth party was so madly intoxicated, that no bell could reach their ear, and no warn-

* *Medrash.*

ing could save them ; and so they remained and perished miserably on the island.

The foregoing is supposed to be rather a parable than a legend, which would seem to point out that only those are truly happy who either steel themselves against the seductions of the world, or else partake of pleasure moderately ; but as it is very pretty, and has a true poetic ring, I have found a place for it in my small collection.

Beruiah, wife of Rabbi Mair, is the heroine of numerous tales and legends. I shall relate the one* reflecting the greatest credit to her memory. She was the mother of two very charming and promising infants, who were idolised by their father, and were the hope of Beruiah. The husband had to go a somewhat lengthened journey, and travelling in those early days was no easy matter. During his absence, the two children sickened, and the day before the Rabbi arrived home they died. Fearing the effect this would have upon her husband, Beruiah hastened to meet him, and with a cheerful mien she asked, " Husband, thou art very wise, tell me. During thy absence, two precious jewels were entrusted to me for safe keeping. I glanced at them day by day, and so prized them that I thought they were my own entirely ; he who entrusted these to me now asks me to return them. What should I do ? " " What shouldst thou do," answered the husband ; " return them at once, without a murmur, nor think at all that even for a brief moment they were thine." In the meantime they had reached the threshold of the door, when Beruiah took her husband to the bedside of his children. " These are the jewels," said the wife. " I *have* returned them, and without a murmur."

The story of *Faust*, which Goëthe has immortalized in poetry, and Gounod in song, has a very strong Semitic

* *Talmud, Berachoth.*

counterpart.* There existed a very learned and ascetic sage, who, from the course of his after-life, has only been known under the name of Acher, or stranger, so that his memory might perish. Now this Acher counted his students by thousands; his college was thronged by the eager multitude who sought learning, and his wisdom was celebrated far and wide. Suddenly, without a warning moment, the man of study appeared in Jerusalem among the gayest and the most frivolous, dressed in the Roman tunic and toga, drank with the votaries of Bacchus, and revelled with the worshippers of Venus. Horror and dismay seized the hearts of his pupils, who all left him, thinking he was possessed of an evil spirit. He was pointed at with the finger of scorn by those who would formerly have kissed the hem of his garment. One pupil, only one, named Mayer, of the many hundreds, refused to leave his old master, but, in spite of contumely and threats, clung to him and loved him yet for the sake of olden time. He would still learn from his old master, though his wisdom was mingled with frivolity; yet the faithful student said, "I will take the kernel, and throw the shell away." One Sabbath day, Acher was riding on horseback, whilst his old pupil followed him on foot. He had gone some long distance, when Acher said to his pupil, "Return thou, Mayer, it is the end of thy Sabbath day's journey, and thou durst not go beyond." "I will return," said the pupil; "but, O master, why dost *thou* not return, and retrace thy steps?" "Too late for me," said Acher; "I hear continually a voice which says, All men shall be saved, but Acher is doomed." "Nay, but come back, dear master; come once again into our college; perhaps the sight of our old haunts may bring new life into thy despair."

Acher allowed himself to be led involuntarily to the

* *Talmud, Ohagiga, 14a, 14b.*

college, when the pupils were reciting this verse: "There is no peace for the wicked, saith the Lord." Acher rushed out, sprang upon his horse, and galloped away. Some time after this, Acher was lying very sick, and was approaching his end. No one came near to him but his old pupil Mayer. He spoke with him, and consoled him; but Acher only muttered, "Too late—too late." And still the youth spoke on, until the whilom sage murmured, "Can one repent one moment before eternity?" and with these words upon his lips he died. Legend states that when his body was consigned to the earth, a fire continued to ascend from the tomb, which nought could quench; but still the pupil remained faithful unto death, and knelt for many a day, and many a night, until the flame departed, when Mayer exclaimed with joy, "Acher is saved, and so shall all the world as well be saved."

I fear I have already trespassed too much upon the indulgence of the meeting, but my object in bringing these extracts from the stories of the olden time, is to strengthen the theories of that school of thinkers who believe that civilisation did not come from one original source. On the contrary, I affirm that our present knowledge is not the offspring of either Egypt, Palestine, Greece, or Rome; but that each and all have contributed stones to that edifice of Culture, the pursuit of which ennobles mankind. Legends, romance, and song are gems, enshrined in the dull, hard and prosaic course of history. Like a mirror, they faithfully reflect the genius of a people. Now, with Homer, with his fiery clang of arms; now with the Keltic bard, with his wail of sorrow and of woe; now with a Teutonic Niebelungen, mad with love, and merry with his mead; now with the Provençal lute, bright with chivalry, and sweet even in despair; and now with the

hope, the resignation, and the meekness of the Semitic peasant folk-lore :

As lamps, high set upon some earthly eminence,
And to the gazer, brighter thence
Than the sphere lights they flout,
Dwindle in distance, and die out ;
While no star waneth yet ;
So, through far reaching night,
Only the star souls keep their light.

For doth not song
To the whole world belong ?
Is it not given, wherever tears can fall,
Wherever hearts can melt, or blushes glow,
Or mirth and sadness mingle as they flow—
A heritage to all ?

The Author is much indebted to the Rev. Professor Prag, who has kindly indicated where these legends are to be found.

INSCRIPTION ON BURMESE BELL,
LIVERPOOL MUSEUM.

TRANSLATION FROM THE PALI¹ AND BURMESE,
By ROBERT GORDON.

I worship Bagawah (replete with the six glories), worthy of homage, possessed of unerring intuitive knowledge. May the excellent remaining Lord Boodh, who is yet progressing towards perfection, who has attained the understanding of the duties of an Areeyah,² and possesses omniscience, graciously come forth and look down towards the foot of the Wisdom-tree (Baudi Bin)!

He it is who has overcome the spirits of heaven and hell, without one exception, with the five evil principles³, in the measure of a Boodh, by means of his power of divination; who is called the "full of virtue"; who has been sifted as finest dust, and selected, and purified as by fire, and beaten and shaped as metal; till he appears as the light of the early dawn before sunrise, replete with the materials and mental powers for the ten thousand periods of existence, and for the attaining to omniscience: to the end that he may see and understand the five great laws⁴; and, clearing away all that

¹ See Note I.

² See Note II.

³ Bodily constitution; 2. Subjection to the laws of the four elements; 3. Passion; 4. Death; 5. The Devil.

⁴ 1. Mutability; 2. Decay; 3. (Phenomenon) Phenomenal existence; 4. (Noumenon) Absolute existence, corresponding to the Kantian philosophy (Nirvana); 5. (Nomen) Nominal existence; this corresponds to the Nominalist doctrine.

obstructs his perfect vision, become full of the knowledge of a Boodh.

In the teachings of that Boodh are inculcated as principal duties :—the culture of religion, the culture of the mind, and the culture of wisdom. By means of these three are attained the eight wonderful things desirable in that religion.

In the time long past, by virtue of that law, the Spirit Dewa established certain rulers of Baiyadatha, who, being followers of those teachings, and attaining the state of Areeyah, their royal line became represented by Sanda Bin, ruler of Basa.

Augatha, holding the place of his eldest son, enjoyed the revenues of the northern cities, and was called the north city chief. He was the principal ruler of Henthawaddee⁵, with its thirty-two cities, his title when he died being Padee Woon Mingyee. He was also called the Mingyee Minhla Nauyata.

I, his Wife, the Woon-gyee-ga-dau, mistress of the household, being desirous of attaining the excellent state of Areeyah, having consulted and discussed with my brother and relatives, caused a commencement to be made, and called together the priests, lay elders, and people of the country about. Before them was completed the transition⁶ to the future state of existence. They having taken not one (piece of money?) went not away. With respect to this matter, the Boodh Thathanau, having said in his excellent teachings that they are excellent disciples who contribute largely to good works, they repeated over and over again the four promises, with the three written signs complete in the law.

Thus, despite the clinging to life in the three states of

⁵ The Old Kingdom, of which Pegu was the capital; it contains Rangoon and several other towns, and the name is still used.

⁶ By burning of the body. See Bishop Bigandet's *Life of Gaudama*, translated from Burmese, with Notes, published in Rangoon, p. 71.

existence⁷, he obtained the blessed result of a happy transition, in this distribution of being, where all the dangers of death are mingled; and, having passed this, may he now obtain peace, and go straight forward to the eternal rest of Nirvana. .

This event occurred in the year 1179 of the common era (A. D. 1817)⁸, when the mother called Kyeik-day-thoot, who, through her love of religion, and especially by her love of good works, had mastered the language of Maghadha, bowing down her head to the Lord Boodh, in front of the priests, delivered a discourse in flowery and ornate language, which, being well weighed, will last for ten thousand years, nay for ten thousand one hundred, six times over will it be exalted.

For this good work shall we obtain full measure of reward, in⁹ circumstances of fortune, mind, and season, without being subject to the four laws, from the dominion of which, together with lust, anger, and the other ten evil passions, we desire to be exempt, and to be at rest, till we reach Nirvana.

In every state of being, those who have the ability to fulfil the law can raise up, assist, and direct those individuals who love the law and desire it.

Having received the order, we desire that the merit of this good work be shared equally with the mother and the father and the grandfather who instructed him; with all those who rule the water and the land, and all things of this world; with all the relatives; with the royal prince, heir to the throne, and the palace rulers; and with all animals and beings capable of love in the several stages of the universe.

May it be shared equally with the grandfather, parents,

⁷ 1. Past; 2. Present; 3. Future.

⁸ See Bishop Bigandet's *Life of Gaudama*, &c., p. 380.

⁹ See Note III.

and friends, without exception, and with all beings full of love, and with ourselves !

By love, reverence, and affection in human beings, the angels are moved to cry, Well done ! well done !

May these angels, in the future time, stand forth as witnesses to the good results of this work !

(Signed) The KYEY-THOON PRIEST, Oo-DOON.
 The POETRY-WRITER AND }
 SHIP-WRITER, } MOUNG BEE.

NOTES.

I. The Burmese received the sacred writings, for the first time, about the beginning of the fifth century, from Ceylon. These were all in the Pali language, which was used in the time of Gaudama, in Maghadha, now North Behar, where he was born. The Pali is closely allied to the Sanscrit : and it is curious to know, that while all the southern Buddhists received their sacred works in Pali, all the northern ones, as those of Nepaul, received them in Sanscrit. Both of these have died out as spoken languages, but the writings remain. The Burmese priests keep the original texts, and study them after a fashion ; but for popular use, these texts are either translated and the translation alone given, or the text and the translation are given together, just two or three words of Pali and then the Burmese (see p. 159) ; the result being a very confusing composition. The priests still endeavour, when writing sacred inscriptions, as on the Bell, to make them up of Pali ; but these usually result in a bald and extremely dry agglomeration of abstract terms, which they are compelled to connect together occasionally with ordinary Burmese, and sometimes also they have to give their meaning in Burmese as well as in Pali. The present inscription is an example of this. The earlier portion of it is almost all Pali, a very few sentences being in Burmese ; whilst the latter portion is nearly all Pali and Burmese translation, side by side.

II. State of Areeyah. In the present state of existence, all beings are subjected to the law of mortality ; and according to the Buddhist principles of metempsychosis, the same individual takes upon himself different states—animal, man or angel—according to the merits or demerits of his thoughts or actions during previous life. The present

existence is therefore one essentially of change, where one, through evil actions, may go backward, and take an inferior form; but if by continued good deeds sufficient progress is made to reach the state of Areeyah, there is no further possibility of retrogression; the individual is released from the law of mortality, and he then continues steadily to progress, without other change, till perfection is reached.

III. Bishop Bigandet's *Life of Gaudama*, pp. 129, 130. Merits and demerits. This principle of merits and demerits regulates all changes of position in the various forms of life. Every event, whether thought, word, or action, is of its own nature good or evil, not only in its immediate external effects, but in its permanent results on the individual responsible for it. These results are sooner or later made manifest; for the individual is himself rendered so much nobler or more degraded by the precise value of the deed. Gaudama gives himself as an example of this, and it forms a prominent feature in his teachings (p. 130). "He said of himself to his disciples, that he had passed, with various fortunes, through the range of the animal kingdom, from the dove to the elephant; that, being man, he had been often in hell, and in various positions of riches and poverty, greatness and meanness, until, by his mighty efforts, he at last freed himself from all evil influence, and reached his present state of perfection."

Any person doing a good action may share the merit of it with any one else; and in the case of a public work, such as the founding of this bell, it is not infrequent for all present to be invited to share in the merit. Here all existing beings are desired to share the merit equally.

For *Budha's Sermon*, p. 115. *Four Truths*, pp. 88, 89. *Four Ways*, pp. 122 and 145. *The Five Budhas*, p. 15.

ROBERT GORDON.

26th Jan., 1874.

[NOTE.—The Bell from which the above translation has been so kindly made by Mr. Gordon, was taken in the War with Burmah in 1824, and was deposited in the Museum by the Trustees of St. James's Cemetery, Liverpool, in January, 1858.

THOS. J. MOORE,
CURATOR.]

THE ANTIQUITIES OF MODERN GREEK.

By REV. E. M. GELDART, M. A.

No negative oxygen, no Greek in Palestine, no Danish settlements in England, no Incas of any importance in Peru! What next? Are all our cherished superstitions to be thus rudely overturned? Surely the audacity of scepticism in these latter days was but faintly foreshadowed by the awful blasphemy of Betsy Prig, when she ventured, in the teeth of the asseverations of the veracious Sairey Gamp, to express not obscurely her misgivings as to the actual existence in the flesh of the redoubtable Mrs. Harris.

After this preface, taken in conjunction with the title of my Paper, you will expect to hear from me that there is no such thing as Modern Greek. Well, I am not going to maintain anything quite so ridiculous, and quite so easy of refutation. For, if by Modern Greek we mean the Greek language as spoken by the Greeks of to-day, those of my hearers whose business takes them on to the Liverpool Exchange will be able to testify that there is such a language, and that they hear it spoken every day of their lives. But what I am going to maintain is something still more paradoxical, though not so easy to refute; namely, that Modern Greek, so-called, and rightly enough so-called when we look at it as a whole, contains innumerable relics of antiquity, and that some of these are more ancient than Ancient Greek itself. This is especially true, as I shall endeavour to show by a few convincing illustrations of the grammatical forms preserved to us in Modern Greek. But there are other features about

the language and literature which are probably very much older than is generally believed. I will divide the Antiquities of Modern Greek into philological, philosophical, and mythological; and under the first head permit me to say a word with regard to pronunciation. Of the possible antiquity of the pronunciation which at present prevails, I will only give one instance, which is, however, sufficiently striking, and, if correctly adduced, would prove that in some of its essential features it is as old as, or older than, the oldest manuscripts of the Homeric poems; if not indeed as old as Homer himself. The *Iliad* of Homer begins, as doubtless you are aware :

Μῆνιν ἀειδε θεὰ Πηληϊάδεω Ἀχιλῆος,
 Οὐλομένην, ἣ μυρὶ Ἀχαιοῖς ἄλγε' ἔθηκεν,
 Πολλὰς δ' ἰφθίμους ψυχὰς αἶδι προΐαψεν.

Sing, goddess of the wrath of Peleus' son, Achilles,
 Destructive, which unnumbered pangs did put on the Achæans,
 And many doughty souls despatched before their time to Hades.

Now the word that I translate "doughty," ἰφθίμους, is without an etymology as it stands. Liddell and Scott, in their celebrated Lexicon, profess, indeed, to derive it from ἰ-φί, which itself is an old instrumental case of ἰ-ς, "strength," and signifies "by strength." In fact, this φί equals the Sanscrit instrumental ending *bhi*, φ in Greek standing regularly for *bh* in Sanscrit; and the very same ending appears as a preposition in the English *by*. For Sanscrit *bh* (= Greek φ) always appears as English, German, Dutch, Danish, Swedish, in short Teutonic, *b*. But this is all by the way. ἰφί is used in Homer as an adverb, in the sense of mightily, strongly, lustily. And Liddell and Scott want me to believe that ἰφθίμος is derived from ἰφί-, θίμος being a mere termination. Well, if θίμος, which is the larger part of the word, be a mere termination, you will agree with me that the derivation proposed by Liddell and Scott does not explain very

much. The word, as thus treated, is like one of those monkeys whose tails are in considerable excess of their bodies. Nevertheless, if *θιμος* were found as a "mere termination," in any other word in the Greek language, so far, so good. But, unfortunately, it is not. And then what about the second *ι* in *Ιφι*? "O, cut it off!" say Liddell and Scott. "Why cumbereth it the ground? It is in our way, so away with it." It does not fit the bed of these modern successors of Procrustes, so chop it off. In vain this letter *ι*, the most self-assertive letter in the Greek as in the English alphabet, declares his own indestructibility. In vain he points to other derivatives, such as *ἰφι-ος*, strong; *ἰφι-κράτης*, holdfast; *ἰφι-γένεια*, born by strength, a name of Artemis; *ἰφιγένητον*, produced by might, an epithet of fire; *ἰφι-άνασσα*, ruling by might; *ἰφι-δάμας*, taming by might; *ἰφι-κλῆς*, renowned for might; *ἰφι-τος*, mighty; and many another: protesting that he never was cut off in his life. No matter! The Dean of Christ Church and the Dean of Rochester have both made up their minds, not only that he may, can, and shall be cut off, but that he has been cut off in this particular word. And when two deans have laid their heads together, and put the weight of all their learning into a book so big that you can hardly carry it, then woe betide so miserable a mite as this little insignificant *ι*. And yet the laws of language are so inexorable that, in spite even of two deans, not one jot or one tittle, *ἰῶτα ἐν ᾗ μία κεφαία*, can pass away till all be fulfilled. Not only can you not show me within the whole length and breadth of the Greek language a single instance of that *ι* being left out,—for, strange as it may seem, in the dative termination of all ordinary Greek words, it is just this little *ι* which has survived, though often only as *ἰῶτα subscriptum*, while the *φ* has long been lost;—but if there is one thing certain about this combination *φθ* wherever you may find it,

it is this, that no letter of any kind has disappeared between the ϕ and the θ . So much for an etymology indubitably wrong; and I have never met with any other save only the one which I am about in all humility to suggest.

Now, suppose for a moment that when this word $\iota\phi\theta\acute{\iota}\mu\omicron\upsilon\varsigma$ was first reduced to writing, the Greek language was pronounced, I will not say exactly the same as at present, but enough so to make the same errors in spelling possible then as now. And suppose that that word $\iota\phi\theta\acute{\iota}\mu\omicron\upsilon\varsigma$ (nom. sing. $\iota\phi\theta\acute{\iota}\mu\omicron\varsigma$) had been written $\eta\upsilon\theta\acute{\iota}\mu\omicron\upsilon\varsigma$ (nom. sing. $\eta\upsilon\theta\acute{\iota}\mu\omicron\varsigma$), which is only an Epic form of $\epsilon\upsilon\theta\acute{\iota}\mu\omicron\upsilon\varsigma$, $\epsilon\upsilon\theta\acute{\iota}\mu\omicron\varsigma$ from $\epsilon\upsilon$ -, well or good, and $\theta\upsilon\mu\omicron\varsigma$, courage or spirit. $\epsilon\upsilon\theta\acute{\iota}\mu\omicron\varsigma$ is a common enough word in Greek, and even occurs in the *Odyssee* in this form; for the Epic form $\eta\upsilon\theta\acute{\iota}\mu\omicron\varsigma$ is optional. $\epsilon\upsilon\theta\acute{\iota}\mu\omicron\varsigma$ means sometimes cheerful, but Xenophon uses it of horses in the sense of high-spirited, mettlesome. The sense would suit exactly. So would the quantity. So would the accent. So would the declension in this case, for it is here an adjective of two terminations, the masculine form serving for the feminine as well, as is usual with compounds; and as regards the sound it would make no difference to a modern Greek whether we wrote the word $\eta\upsilon\theta\acute{\iota}\mu\omicron\varsigma$ or $\iota\phi\theta\acute{\iota}\mu\omicron\varsigma$. Now, if this derivation be not correct, I think you will agree with me that we have here an almost miraculous coincidence. But if it be, then three peculiarities of modern Greek pronunciation are established as extremely ancient, viz., the resemblance, now amounting to identity between ι and η , and between both these and υ (for an old Greek, Euclid by name, has taught us that things that are like unto the same are like unto one another; and he might have added that the converse of this statement is equally true, viz., that things which are like unto one another are like unto the same), and in the third place the consonantal value of $\upsilon = \phi$, after η . Our English pronunciation of lieutenant as *leftenant* is somewhat analogous to this.

I am bound, however, to mention that when ἰφθίμος is used of persons it has three terminations; as we see from ἰφθίμη ἄλοχος, brave spouse, not ἰφθίμος ἄλοχος. This may at first sight appear a difficulty; for it would seem to imply that after all ἰφθίμος was not a compound adjective = εὐθυμός. But on the other hand, we are confronted by the positive fact that in ἰφθίμους ψυχὰς, and other similar cases, ἰφθίμος certainly is a compound of whatever it may be compounded; for only a compound adjective of the *ο*-declension could be of two terminations. What, then, does ἰφθίμη ἄλοχος prove? Not that ἰφθίμος was originally no compound, for the contrary is manifest from ἰφθίμους ψυχὰς, but that before the former usage could arise the derivation must have been forgotten; for no compound noun in Greek would be consciously thus declined. But in order for the derivation to be forgotten, the word must have been written ἰφθίμος, for no man could write ηὐθυμός without remembering the true etymology. Hence the pronunciation of ηὐθυμός = ἰφθίμος may be said to be as old as the Homeric poems themselves. But no one accustomed to read ἰφθίμος, *ifthímos*, and ηὐθυμός, *yoo-thyóo-mos*, would so much as dream of comparing the two.

And now for a few grammatical forms. The Romaic genitive of δόξα—δόξας is not only the Doric but the older form. The plural nominative δόξαις, for cl. δόξαι, preserves a *ς* which is lost in classical Greek. The accusative, which is also δόξαις, is the Æolic form, and the change in the vowel sound from *α* to *αι* is interesting, because it registers the loss of *ν* before *ς*. Cf. in ancient Greek the Æolic forms πράξαις, πράξαισα, classical πράξας, πράξασα, for πράξανς, πράξανσα. The stem πράξαν- appears in neuter πράξαν, gen., mas. and neut. πράξαν-τος, etc. The Greek language does not tolerate the combination *νς*. The Latin *Constans* becomes in Greek Κόστας.

Compare also 2nd p. s., pass. or mid. present, $\phi\acute{\epsilon}\rho\epsilon\iota$ or $\phi\acute{\epsilon}\rho\eta$ in classical Greek, with modern Greek $\phi\acute{\epsilon}\rho\epsilon\sigma\alpha\iota$, and Sanscrit *bhárase*, and you see at once that whereas the classical Greek has, according to the custom of the Tonic dialect, of which the Attic is a form, dropped the σ between two vowels, and contracted $\epsilon-\alpha\iota$ into $\epsilon\iota$ or η , the Romaic has preserved the original form intact. In the same way the imperfect gives us in classical Greek $\acute{\epsilon}\phi\acute{\epsilon}\rho\omicron\upsilon$ for $\acute{\epsilon}\phi\acute{\epsilon}\rho-\epsilon(\sigma)\omicron$, while the full form $\acute{\epsilon}\phi\acute{\epsilon}\rho\epsilon\sigma\omicron$ survives in modern Greek.

Compare again, Homeric $\phi\epsilon\tilde{\upsilon}\xi\epsilon$, 1st aor. imp. 2nd sing. of $\phi\epsilon\tilde{\upsilon}\gamma\omega$, with classical $\phi\epsilon\tilde{\upsilon}\xi\omicron\nu$, and modern $\phi\epsilon\tilde{\upsilon}\xi\epsilon$; or again, Homeric $\acute{\imath}\sigma\omicron$, "be thou," with classical $\acute{\imath}\sigma\theta\iota$, modern $\acute{\imath}\sigma\omicron$; $\acute{\imath}\sigma\omicron$ is the middle form, which is lost in classical Greek though preserved in Homeric and modern. Modern Greek, however, gives us middle forms which Homer has not, viz., $\acute{\epsilon}\lambda\mu\alpha\iota$, I am; $\acute{\epsilon}\lambda\sigma\alpha\iota$, thou art; $\acute{\epsilon}\lambda\mu\epsilon\theta\alpha$, we are; $\acute{\epsilon}\lambda\sigma\theta\epsilon$, ye are; and also inf. $\acute{\epsilon}\lambda\sigma\theta\alpha\iota$, to be.

This verb appears in all languages in a very mutilated form. A word so continually in use is subject to much wear and tear. The Indo-Germanic root is *as-*. We have it in our English *is*, Germ. *is-t*, Lat. *es-t*, Greek $\acute{\epsilon}\sigma-\tau\iota$, Sanscrit *as-ti*. Therefore, when we find the participial stem *sant-* in Sanscrit, the same that appears in the Latin stems *præ-sent*, i. e., being by, *ab-sent*, i. e., being away, we know that this is only worn away from *asant-*, which ought to appear in Greek as $\acute{\imath}\sigma\omicron\nu\tau-$, nom. $\acute{\imath}\sigma\omega\nu$ for $\acute{\imath}\sigma\omicron\nu\tau\varsigma$, the combination $\nu\tau\varsigma$ not being allowed in Greek. But in Attic Greek we only find the stem $\acute{\omicron}\nu\tau-$, nom. $\acute{\omega}\nu$, gen. $\acute{\omicron}\nu\tau\omicron\varsigma$, fem. $\omicron\upsilon\sigma\alpha$, for $\acute{\omicron}\nu\sigma\alpha$, gen. $\omicron\upsilon\sigma\eta\varsigma$ for $\acute{\omicron}\nu\sigma\eta\varsigma$, etc. But old Ionic and Epic give us $\acute{\epsilon}\acute{\omicron}\nu\tau-$. Knowing that ς tends to fall out between ϵ and \omicron ; and with Sanscrit *'sant-*, Lat. *'sent-*, etc., to guide us, we may ideally restore $\acute{\imath}\sigma\omicron\nu\tau-$. Now let us turn to Modern Greek, and what do we find but an indeclinable present participle, $\acute{\imath}\sigma\omicron\nu\tau\alpha\varsigma$ = being?

Those of my hearers who have ever studied Greek will have heard of the famous digamma. The name is purely fanciful, meaning two gammas, because this ancient and long obsolete character, found only in old inscriptions, φ , was supposed to resemble a double Γ . In sound they had little in common, though it does so happen that in certain cases γ appears as representative of an original φ . The reason, that the φ , or $Ba\tilde{u}$, as it was called, came to be given up, was probably not because the sound was lost,—although it is true that it very commonly disappeared at the beginning of a word,—but because other letters in certain combinations came to have the same sound, or at least one closely similar. The φ stands, as we know, for the Latin V, Sans. V, Germ. W, Eng. W. Whether it was originally sounded as English w or as v , we do not pretend to decide. In Dutch and German, according to the dialect, or in some cases the position of the letter, every possible gradation may be observed between v and w in the pronunciation of the character which is written w . The Cockney has a *tertium quid* with which he confounds both, so that his v 's sound like w 's, and his w 's like v 's. He seems to say, “Wery vell,” instead of “Very well.” “Put it down a Wee, my lord, put it down a Wee!” expresses with exquisite humour and terseness the gist of the whole matter. Perhaps such a *tertium quid* was the φ . How it came to be represented in classical Greek, for the most part, is plain, from the way in which its Phœnician name (the Greek alphabet, names and all, being borrowed almost wholesale from the Phœnician,) was written by Greek Grammarians, viz., $Ba\tilde{u}$. Here you see it appears before a vowel as β , after a vowel as υ ; another testimony to the antiquity of modern Greek pronunciation, for in modern Greek this combination $Ba\tilde{u}$ would be sounded $v\acute{a}v$. So in Laconic we have $\beta\alpha\lambda\acute{\iota}κ\iota\omicron\varsigma$ for $\varphi\alpha\lambda\acute{\iota}κ\iota\omicron\varsigma$ = Attic $\eta\lambda\acute{\iota}κ\iota\omicron\varsigma$; where, as in other cases, the loss of the φ is compensated by the aspirate ($\acute{\prime}$). Ἑτος is the Greek

for a year. Cf. Sans. *vats-as*; Lat. *vetus*, *vetus-tus*, old, or "in years"; Slavonian, *vet-ŭchŭ*; Albanian or modern Græco-italic, βῖτ, a year; as well as Laconian δια-βέτης, i.e., two-years old, *φέτια* = ἔτη, years; *φικατιφέτιες* = εἰκοσιετείς, twenty years old, in Boeotian inscriptions; and you will see at once that ἔτος stands for *φέτος*, but without any compensating aspirate. Now the *ʹ* in modern Greek, as in modern Latin (French, Spanish, Italian, etc.), is silent; but in the compound ἐφέτος, only found in modern Greek, from ἐπὶ, syncopated to ἐπ' and ἔτος, the φ instead of the π shows traces of a lost aspirate, which in its turn is a relic of the *F*. In ancient Greek, ἔλος means a marsh. Ἐλέα is one Greek form of the Latin Velia, the name of a place in a marshy district. So, too, we have the marshes of Velitræ; and in Veles-trom, in an inscription at Velitræ, meaning, "of the dwellers in the marsh," gen. plural, we have the very form we postulate in the Greek, for Veles, written in Greek letters *φέλες*, is the crude form of *φέλος*, gen. *φέλους* for *φέλεος* for *φέλεσ-ος*. The same word appears in Ἡλις, another marshy country, whose Attic name only stands for the Dorian *ῥᾱλις*. Well, in Modern Greek we get βάλ-τος, signifying a marsh. This word also appears in Byzantine, or later Hellenistic Greek, as βάλτη, feminine. The commonest instances of *F* lost in classical but preserved in modern Greek, are those in which it survives, as *υ*, pronounced *υ*, between two vowels. In classical Greek, on the contrary, it is mostly lost in this position, but preserved, as also in modern, before a consonant. Cf. χέω for χέφω, "I pour," future χεύ-σω, with modern χεύω, πνέω, πνεύσω, m. g. πνεύω, "I breathe." ῥέω for σρέφω, Sansc. *srávāmi*, f. *ρεύσομαι*, m. g. *ρεύω*, "I flow"; πλέω, Sansc. *plávāmi*, implied in the middle *plávê*, fut. *πλεύσομαι*, m. g. *πλεύω*, "I sail." Κλάω, "I cry," for κλάφω, fut. *κλαύσομαι*, m. g. *κλαύγω*; καίω for καφίω, fut. *καύσω*, m. g. *καύγω*; where γ = ι, as in many similar cases, both

in ancient and modern Greek. I will now illustrate this modern Greek *F*, as well as the occasional equivalence of *γ* to *ι* consonantal, *ab ovo*, in a very literal sense. The classical Greek for egg is *ὄον*; the Latin is *ovum*. We may therefore fearlessly infer *ὄFον* as an earlier Greek form. In Sappho we find *ὄιον*, and Hesychius gives us the plural *ὄβεια*, as an Argive form. In both these words the accent seems shifted, a thing which will sometimes occur. Now, the Latin *avi-s*, Sanscrit *'vi-s*, "a bird," compared with the Greek derivative *οἰωνός* for *ὀφίωνός*, lead us back to an ancient Indo-Germanic root, *avi-*, which, with the adjectival termination, as would give us *avyás*, *i. e.*, belonging to a bird. There is little doubt, then, so Benfey the great Sanscrit scholar thinks, that the ideal *ὀFιον* was the neuter of this ideal adjective *avyás*, viz., *avyán*, which would mean, of course, "a birdling," a something laid or dropped by a bird. If so, the most ancient form of the said word in Greek would be *ὀFιον*. In modern Greek we find *αὐγόν*. Now compare *ὄον* classical, and *αὐγόν* Romaic, and judge for yourselves which is the most ancient. Compare again the classical *ὠτίον*, dim. of *οὔς*, ear, stem *ὠτ-*, as we see in genitive *ὠτός*. Now the Cretan and Laconian form *αὔς*, stem *αὐτ-*, warn us here to expect *F*. This connects the first part of the word *αυ* with the *ἄF* or *αὐ*, which we have in *ἄFω*, for *ἄFω*, "to hear"; in *au-ris*, Latin for ear, *au-dio* and *aus-culto*, "to lend the ear," "to hear," "to listen." A comparison of the Slavonian *ușese*, Lithuanian and Latin *ausis* (for *auris* was *ausis* in old Latin), leads Curtius (*Grundzüge der Griechischen Etymologie*, s. v.,) to the conclusion that *αὔσατ-* was the most ancient Greek stem; *σ* in the Greek, as we have seen repeatedly, always tends to fall away between two vowels. Very instructive is it here to compare the Albanian or modern Græco-italic *βῆ*, ear; especially when we place beside it *βῆ*, which is Albanian for egg. For just as *βῆ*

seems to be ἀβε̂ = αὐγόν, mutilated, so has the first syllable of ἀβε̂ς = αὐς disappeared, leaving us only βε̂ς; but in both cases in this mere fragment the *F* is preserved. Now, in the modern Greek for ὥτιον, we have lost indeed the *ς*, but the *F* still remains to us in the Romaic αὐτίον. One more example and I have done with the *F*. In ancient Greek, δα-λός signifies a torch or firebrand. It comes from the root δά*F*-, which we find in δαίω, i. e., δά*F*ω, p. p. δε-δau-μένος. Hesychius also gives us δαβεῖ for δα*F*ῃ, i. e., “that he may be burnt,” 3rd pers. sing. sec. aor. subj. pass., and also δαβελός for δαλός. In Sanscrit, *dav-as* and *dava-thus* mean burning heat. All this G. Curtius tells us in his wonderful book, called *Grundzüge der Griechischen Etymologie*; but what if he had known that to this day the modern Greek as such knows no other form of δαλός than δαυλός? in which you see the *F* still survives. Really it is absurd enough to call this letter the digamma, for it is not a gamma at all, and it never will say die!

And now for a few more archaisms of another kind. It is a peculiarity of Epic Greek, as many of you are aware, to use past tenses without the temporal augment. This temporal augment is a syllable prefixed to verbs in the past tense. It is as old as Sanscrit, and therefore older than Homer; but still it is a peculiarity of Homer, the oldest Greek writer we know of, to miss it out. In fact, this is an antique modernism as much as a modern antiquity. It occurs in Homer, and it recurs in modern Greek, but is not found in Attic prose. Another Homeric, and indeed Ionic, idiom is the employment of the definite article ὁ, ἡ, τὸ, as a relative pronoun. Now I can show you both these Homericisms at once in a modern Greek Cretan poem of the sixteenth century; compare, then, the following words, τὰ κάμαν καὶ τὰ φέραν, with the (scanning apart) quite possible Epic, τὰ κάμον καὶ τὰ φέρον,

but which would be in classical Greek, *ἂ ἐποίησαν καὶ ἂ ἔφερον*; and then say whether I am exaggerating when I speak of the antiquities of modern Greek. Even *ἔκαμον*, for “made,” or “did,” would not stand in Attic Greek; for there *κάμνειν* has acquired the sense of being weary with work. Another Homeric usage is the employment of this same definite article as a personal pronoun, as in the well-known line,

“*Τὸν δ' ἀπαμειβόμενος προσέφη κρείων Ἀγαμέμνων.*”

“Him answering bespake the ruler Agamemnon.”

In modern Greek and in Homeric alike, *τὸν εἶδε* would mean “he saw him”; *τὴν εἶδε*, “he saw her”; *τοὺς ἔβαλε*, “he cast or put them”; whereas in Attic Greek we should require *αὐτὸν*, *αὐτήν*, *αὐτούς*. There are even words in modern Greek not found in any form in classical Greek, which yet must have lain hidden somewhere or other throughout the history of the Greek language. Such a word is *φαρδύς*, “broad,” with its substantive *φάρδος*, “breadth.” The termination alone shows that this is a genuine Greek word, as does also the substantive *φάρδος*. No foreign importation into modern Greek ends in *ύς*, nor forms its substantive without the addition of a syllable; but the classical Greek for broad is *εὐρύς* or *πλατύς*, two words of entirely different etymology. Yet perhaps we have the root of *φαρδύς* in *πέ-φραδ-ον*, “I told,” “I showed,” “I set forth.” For the original sense may well have been “to make broad, or wide”; for instance, in Homer, *μῦθον πέφραδε πᾶσιν*, means, “made known the word to all,” “spread it far and wide.” So in German to this day, “to make a show of oneself, to show off,” is, “*sich breit machen*,” literally to make oneself broad. A curious analogy is presented within the limits of the Greek language; and here again the modern Greek seems to have kept the primitive, which we

may be sure was always the physical, the outward, the sensuous application. I refer to the Greek word *τρανὸς*, or *τρανής*, which in ancient Greek means plain, obvious; but in modern, or as I suspect most ancient Greek, big, fat, portly. Of course it is easier to see a fat man than a lean one; as the thin Irishman in the duel acknowledged, when he proposed for the sake of fairness to draw two chalk lines down the stouter body of his English adversary, and suggested that any ball which might strike him outside those limits should not count! If Mr. Pickwick on a certain occasion had told his friend, Mr. Tupman, that he was a very *conspicuous* object,—that in fact there could be no doubt about him,—instead of bluntly informing him that he was “too fat” to dress like a bandit, he would have conveyed his meaning equally well and less offensively. But to return to *φαρδύς*. It is indifferent whether we suppose the root to be *φάρδ-* or *φράδ*; the metathesis of *α* and *ρ* is constant in Greek,—witness, *κράτος*, *κάρτος*, *καρδία*, *κραδίη*, *λάρσος*, *θρασύς*. We are reminded by such transpositions of our own “bird,” and the Lancashire “brid.” It may be observed that the tendency to transpose *r* and a preceding vowel, arises as soon as the *r* is strongly trilled or rolled, especially after a short vowel. Now when we remember that *φ* in Greek regularly appears in the Teutonic languages as *b*,—cf. *φράτωρ*, *brother*, *φι*, *by*, *φλυ-*, *blow*,—we are strongly tempted to identify *φραδ-ύς* with *broad*; Goth. *braids*; Dutch *brijd*; Mhg. *breit*. But there is one difficulty; Greek *δ* should not, if it represents an original Indo-Germanic *d*, appear as *d* in English, or any form of Low German. It ought to become *t* in English, and *z* in German; e. g., *δύο*, *two*, *zwo*; *δέκα(ν)*, *ten*, *zehan*; *δέρ-ω*, *tear*, *zehre*; *δ-δόντ-ιον*, Dutch *tand*, Germ. *Zahn*. At the end of a syllable, however, the rule would seem not to hold so absolutely, for no philologist ventures to doubt the identity of *σχίζω*, i. e., *σχίδ-ω*, and the Gothic

(Low German) *skaida*, "to cut or part."* The difficulty is then perhaps not insuperable. But we do not even know that the δ in the modern Greek $\phiαρδύς$ does stand for an original *d*; it is quite as likely softened from τ , nay almost certainly if it be the same with the δ in $\piέφραδον$, and $\phiράζω$, i. e., $\phiράδ-ιω$ for the dialectic form $\phiράσσω$, and even $\phiράττω$ is found, and they imply $\phiράτ-ιω$. Now τ may be, and often is, softened to δ , but δ will not harden to τ . Therefore, given $\phiρατ-$ and $\phiραδ-$, there is no doubt which is the older. Now $\phiρατύς$ might give us *broad* in Low German, and *breit* in High, just as $\piατήρ$ becomes *fadar* in Gothic, and *fatar* in Old High German.

It is also possible that the δ in $\phiαρδύς$ stands for an original θ , as in the case of $\psiεῦδος$, whose earlier form appears to have been $\psiῦθος$. If $\phiραθύς$ were indeed the primitive form, then *broad* in English, *breit* in German, would be perfectly regular. But in any case we have between $\phiαρδύς$ and *broad*,—1. exact identity in meaning; 2. perfect agreement in three out of the four letters of the root. In such a case the difficulty caused by the final letter would not be enough, I think, to shake the faith of a practised philologist in the main identity of the two words. It is precisely in the last letter of the root that irregularities in words undoubtedly identical most often occur. We may even give up the final letter, and regard it as a separate suffix in the respective languages; but the identity of $\phiρα-$ and *broa-* will still remain, I think, almost indisputable. One thing is certain, that if $\phiαρδύς$ in Greek has anything to do at all with Goth. *braids*, English *broad*, it cannot be as Sophocles (*Greek Lexicon of the Roman and Byzantine Periods*, Boston, 1870, page 80,) suggests, borrowed from

* Professor Max Müller writes to me on this word. "Gothic *skaida* is irregular; it ought to be *skaita* if connected with *scindo*, $\sigmaχίζω$, *khid*. Yet the *d* may be explained by the influence of a lost *n* before *d*."

the German, for the change of ϕ into b would on that supposition be quite impossible.

Take another example of Modern Greek Antiquities. The Greek for "to bite" is $\delta\acute{\alpha}\kappa\text{-}\nu\omega$, but the Sanscrit for "a bite"—in classical Greek, $\delta\eta\gamma\mu\alpha$ for $\delta\eta\kappa\text{-}\mu\alpha$ —is *dançman*, showing a very ancient nasalisation of the root. In modern Greek we have for the verb $\delta\alpha\gamma\kappa\text{-}\acute{\alpha}\nu\omega$, and for the noun $\delta\acute{\alpha}\gamma\kappa\text{-}\omega\mu\alpha$. With two more examples I will leave the more strictly philological portion of my Paper. $\epsilon\nu\nu\omicron\iota\alpha$ is classical Greek for "a thought or reflection," compounded of $\epsilon\nu$ and $\nu\omicron\iota\alpha$, i. e., "inward knowledge." Now that $\nu\omicron\iota\alpha$ has lost a γ , we know, from $\acute{\alpha}\text{-}\gamma\nu\omicron\iota\alpha$, ignorance; $\acute{\epsilon}\text{-}\gamma\nu\omega$, "he knew," etc. In fact the root $\gamma\nu\omicron\text{-}$ is the same as that of our *know*. It is interesting, therefore, to find in modern Cretan $\acute{\epsilon}\gamma\nu\omicron\iota\alpha$ for $\epsilon\nu\nu\omicron\iota\alpha$, where the ν of the preposition is dropped, but the γ of $\gamma\nu\omicron\iota\alpha$ is preserved.

But it is more interesting to find that the modern Greek $\sigma\acute{\upsilon}\nu\text{-}\nu\epsilon\phi\alpha$, i. e., an assemblage of clouds, is in some dialects $\sigma\acute{\upsilon}\gamma\nu\epsilon\phi\alpha$, because this shows the identity of $\nu\acute{\epsilon}\phi\omicron\varsigma$, a cloud, with $\gamma\nu\acute{\omicron}\phi\omicron\varsigma$, darkness, and $\kappa\nu\acute{\epsilon}\phi\alpha\varsigma$, dusk. Now as there is no disputing the identity of $\nu\acute{\epsilon}\phi\omicron\varsigma$, cloud, and the Sanscrit *nabhas*, which corresponds exactly [$(n = \nu + a = \epsilon + bh = \phi + a = o + s = \varsigma) = (nabhas = \nu\acute{\epsilon}\phi\omicron\varsigma)$], there is no room to doubt that here again our poor despised Romaic has preserved, though in a softened form,—i. e., γ instead of κ ,—a guttural which has been lost entirely in Sanscrit, the most ancient known language in the world; the most ancient at least, upon the whole, of all Indo-Germanic tongues. Surely these are facts worth hunting for.

And now I turn to what, for want of a better name, I call the philosophical antiquities of modern Greek. Had it not been for ancient Greek philosophy, not only modern Greek, but mediately through Latin modern English also, would

have been impossible. Like the man who had been talking prose all his life long without knowing it, so we have been talking philosophy. When the Liverpool or London tradesman informs you that at his establishment you will find quality combined with quantity, he is only echoing what the Athenian shopkeeper declares concerning the ποιότης and ποσότης of the goods which he retails. Now these words really date from the era of Socrates, Plato, and Aristotle. Socrates first introduced, and they elaborated, the doctrine of abstract ideas; before, men had talked of *such* and *so much*, but they never dreamt of *suchness* and *so muchness*. So again, if you ask a Greek whether he is subject to headache, he will perhaps reply, ὅχι ἐν γένει, i. e., not in general. He will also tell you of the γενικὴ ὑπόληψις τοῦ λαοῦ, i. e., the general estimation of the people. But before the time of Socrates, Plato, and Aristotle, γένος only meant a *race*, or *tribe*, or *generation*; ἐν γένει would mean accordingly "in the race," "tribe," or "generation." But Plato first used it of a large class, a wide comprehensive unity, as opposed to the separate units, or εἶδη, species, or rather specimens, which go to make it up. Before his time, again, that word εἶδος meant only shape, appearance; but now look what has become of it. The modern Greek says, ἔχω τὴν τιμὴν νὰ σᾶς εἰδοποιήσω, "I have the honour to inform you," literally, to *specify to you*. The Apothecary calls his drugs εἰδίσματα, as we say *specifics*. Τὸ εἰδικόν μου simply means *mine*, *my own*, i. e., *my special*. So the philosophy of one age turns out to be the grammar of the next. Μερικὸς is modern Greek for *some*. How comes it so to be? The Cyrenian philosophers first used the word in speaking of μερικαὶ ἡδοναὶ, from μέρος, a part, by which they meant not at all *some* pleasures but *particular* pleasures, as opposed to that *general* well-being of the whole man, in which their notion of the end of life was summed up.

If you tread by accident on a Greek's toe, and express a hope that it did not hurt him, he replies, if he be wise, *διόλου*, or *καθόλου*, i.e., [not] at all; the negative being understood, as in the French "du tout!" This is true philosophy, no doubt. Yes, but whose originally? Why that of Socrates himself, who first employed what he called general definitions, *διορισμοὶ καθόλου*, i.e., definitions covering the whole of the facts on which they were founded.

It has often been asked, What is the use of talking logic to ladies? Well, suppose Aristotle were to appear in the midst of a company of fair Grecian damsels in the present day, anxious to improve their minds, and to expound to them the mysteries of his *ἄμεσος πρότασις*. Don't think they would not understand him. Trust them! but not exactly as he intended to be understood. For while he means a "proposition without a middle term," they would take him much more simply to contemplate an "immediate proposal." And very naturally! The propensities, *ὀρέξεις*, of humanity receive, as one might expect, large treatment in his *Ethics*. But the modern Greeks have singled out one of these for special honour; and when a man says to his friend, *σᾶς εὐχομαι καλὴν ὀρεξίν*, he means, not "I desire for you an honourable passion," but "I wish you a good appetite."

Ὑλη, in ancient Greek, meant wood. By restoring the initial *σ*, as in *ὕς* or *σὺς*, Lat. *sus*, a swine, *ἐπτά* for *σепτάμ*, Lat. *septem*, *ἕξ*, Lat. *sex*, etc., we identify it as *σύλ[F]α*, with Lat. *silva*. Plato, as he called his Creative Reason *δημιουργός*, or Artificer, regarded matter as the wood, *ὕλη*, out of which the world was made. But what would he have said if he could have beheld in a stationer's shop in Athens, a card bearing the inscription, *γραφικὴ ὕλη*, writing materials? Ὑπόθεσις, with Plato, means the assumption laid down on which an argument is to be founded; but if he were now to enter into conversation with one of our Greek merchants, who had no

great turn for metaphysical disquisitions, the latter would probably say, before five minutes were out, "Ἀς ἐμιλήσωμεν περὶ ἄλλης ὑποθέσεως, by which he would mean, not at all that they should enter upon the discussion of a fresh philosophical assumption, but simply "let us change the subject." And I rather suspect that is what some of you are saying now. Well, one more philosophical or rather theological curiosity, and I have done; asking you to take comfort in the assurance that there is plenty more where that comes from. The word πρόσωπον has a curious history. It meant originally what it also occasionally means still—a face, a countenance: for this primary sense has never been lost, though secondary and tertiary significations have been added. The root is ὁπ-, see, which we have in ὅπωπα, I have seen, redup. perfect. ὄψομαι (ὅπ-σομαι), I shall see, ὄψις (ὅπ-σις) sight, ὀπή a spy-hole, ὄμμα for ὅπ-μα, the organ of sight, ὀφθαλμός = ὀπ-θάλαμος (?), the chamber of sight, the eye. This π has been changed from an original κ, through the influence of a contiguous lip letter, probably the F, which, in the German *augó*, modern German *auge*, precedes, as a vowel, instead of following the guttural. Thus we can connect with the root ὁπ = ὁκ, Lat. *ocu-lus*, dimin. from *oculus*, *ec-ce*; see here, as in "Ecce Homo;" and Slavonian *oko*, Lith. *aki-s*, an eye. Πρόσωπον means then "the look towards," "the face," "the aspect." But, meaning the face, it was also used for the "sham face," "the mask on the stage." Hence we get τὰ τοῦ δράματος πρόσωπα, half Latinised into *dramatis personæ*, the persons of the drama. And in modern Greek, as already in the New Testament, it has come to signify not only the persons on the stage, but persons anywhere else: thus endorsing the judgment of that great playwright whom our French neighbours call the "Immortal Williams," to the effect that

"All the world 's a stage,
And all the men and women merely players."

The New Testament Greek for a respec^ter of persons, is προσωπολήπτης, "one who puts up with masks," and God, we are told, is none such. But now, just see what havoc this word πρόσωπον has made in that branch of metaphysics which theologians claim as their own. Sabellius, about 250 A.D., believed in a Trinity of manifestations, πρόσωπα, of one God. He used the word in its primary acceptation of aspect, or face. And Sabellius, as all the world knows, was a heretic, soundly cursed by good Christians ever since. But if Sabellius were now alive, would he be surprised to learn that he is perfectly orthodox? For in a modern Greek translation of the Anglican Liturgy, published by Messrs. Bagster, if we turn to the Athanasian Creed, we there find a declaration, at which certainly no one would have been more astonished than Athanasius himself, to the effect that "This is the Catholic Faith, that we worship one God in Trinity, and the Trinity in Unity, neither confounding the persons (πρόσωπα), nor dividing the substance, for there is one person (πρόσωπον) of the Father, another of the Son, another of the Holy Ghost." So that here the old ὑπόστασις of Athanasius (not that he wrote the Creed) is rendered into modern Greek by the πρόσωπον of Sabellius. Considering that every one who "does not hold this faith pure and undefiled,—δίχως ἄλλο χάνεται αἰωνίως," (need I translate the words?) it really would be interesting to know at what precise point of time it ceased to be damnable heresy, and came to be indispensable orthodoxy, to substitute the τρία πρόσωπα of Sabellius, for the τρεῖς ὑποστάσεις of Athanasius.

"Where ignorance is bliss, 't is folly to be wise;" and the less our clergy know of modern Greek (as well as of modern Science), the better for their peace of mind. Theology, as at present handled, forms a convenient bridge from philosophy to mythology. To mythology then we will betake ourselves without more ado. There is a modern Greek

mythology as well as an ancient one; and perhaps, from its greater simplicity, we may be justified in regarding it as the modern representative of the rude material from which in process of time the genius of a Hesiod, an Orpheus, or a Homer elaborated the complex network of legendary lore, which has been the delight and wonder of the world for more than two thousand years. But remember, our Greek mountaineers, from whose rude ballads I propose in chief to draw my illustrations, never heard in their lives the names of Homer or Hesiod, much less ever read a line of their writings. If their language is as we saw archaic in many of its forms, far more archaic than that Attic Greek which with a modernised syntax their cultivated countrymen employ, yet such archaism is purely unconscious and involuntary; and so it is equally with modern Greek mythology. The Greek is as good a heathen now as ever he was of old. I mean the Greek shepherd or robber, who lives in the wild or in the village, who never reads a book, nor hears a sermon, except, perchance, when in the town on some fine market day he strays into a church, and listens to something which he only very partially takes in. In the seven hundred ballads, and eleven hundred couplets, collected by the laborious German assiduity of Arnold Passow, the references to Christ and Christianity are few and far between; and even Jesus and the Saints, the favourites of whom are St. George, St. Basil, and St. John, appear quite mythical personages in the popular songs of Greece. But they are altogether subordinate to the real heroes of modern Greece, the demigods, dragon-slayers, and spirits of the flood, the mountain and the forest; and indeed the former are seldom remembered or invoked, except on their special festivals. The Greeks know nothing of the Christian heaven or hell; I mean, of course, the unsophisticated peasantry. Hades, the dark under world, in which the

unsubstantial shades still wander half alive, preserves its ancient name, and all its ancient power of dreary fascination.

Ἄδης, τὰ τάρταρα τῆς γῆς, ὁ κάτω κόσμος, are still the familiar appellations of this underground domain. The real God of the modern Greeks is Charon, Χάρος, or Χάροντας. Χάρων was of old best known as the ferryman of the Styx, or the river of death. But now-a-days he is usually on horseback. In whatever manner he appears he is the personification of death, but as thoroughly believed to have a personal existence as any human being. The childlike simplicity of the popular faith in this respect is a striking testimony to the never-dying freshness of Greek fancy—as young and strong now as in days of yore. Listen to the following description, which I have translated, as far as possible word for word, from one of the most familiar of the people's songs :

Τί εἶναι μαύρα τὰ βουνὰ καὶ στέκουν βουρκωμένα ;
 Μήν' ἄνεμος τὰ πολεμᾷ ; μήνα βροχὴ τὰ δέρνει ;
 Κούδ' ἄνεμος τὰ πολεμᾷ, κούδ' βροχὴ τὰ δέρνει·
 Μόνη διαβαίν' ὁ Χάροντας μέ τοὺς ἀπεθαμμένους·
 Σέρνει τοὺς νιοὺς ἀπὸ 'μπροστά, τοὺς γέροντας κατόπι,
 Τὰ τρυφερὰ παιδόπουλα 'ς τὴν σέλλ' ἀρραδιασμένα.
 Παρακαλοῦν οἱ γέροντες, κ' οἱ νέοι γονατίζουν·
 " Χάρε μου, κόνεψ' εἰς χωριὸν, κόνεψ' εἰς κρύα βρύσι,
 Νὰ πιοῦν οἱ γέροντες νερόν κοί νιοὶ νὰ λιθαρίσουν,
 Καὶ τὰ μικρὰ παιδόπουλα νὰ μάσουν λουλουδάκια."
 " Κούδ' εἰς χωριὸν κονεύω ἐγώ, κούδ' εἰς κρύα βρύσι.
 Ἔρχοντ' ἢ μάννες γιὰ νερόν, γνωρίζουν τὰ παιδιά των·
 Γνωρίζονται τὰνδρόγυνα καὶ χωρισμόν δὲν ἔχουν."

Why are the mountains black with gloom, why stand they darkly lowering ?

Is it the wind that buffets them ? is it the rain that beats them ?

No wind it is that buffets them : no rain it is that beats them ;

But it is Charon passing by, and lo the dead are with him.

Foremost he drags the young and strong, the old and feeble hindmost ;

The tender children in a row are ranged about his saddle.

The old men beg, the young beseech with piteous supplication :

“ Good Charon, halt, O halt awhile, by village or cool fountain,

That so the old may slake their thirst, the young may sport with pebbles,

The little children gather flowers, and bind them into posies.”

“ No halting-place for me,” says he, “ by village or cool fountain,

Lest mothers to fetch water come, and know again their children,

Lest husbands know again their wives, and be once more united.”

That this conception of Death on horseback is at least as old as the first century A.D., we may gather from the book of Revelation, ch. vi. v. 8 : “ I saw and beheld a pale horse, the name of him that sat thereon was Death, and Hades followeth with him.” There is a fine description of Charon, according to the modern Greek view of his character, in the tragedy of *Erophile*, written in the seventeenth century, in the Cretan dialect, by one Chortakes. It opens with a monologue by Charon, who thus describes himself :

‘Η ἄγρια κή ἀνελύπητη κή σκοτεινὴ θεωρία μου
Καὶ τὸ δρεπάν’ ἀποῦ βαστῶ, καὶ ταῦτα τὰ γυμνά μου
Κόκκαλα, κή πολλαῖς βρονταῖς κή ἀστραπαῖς ὁμάδι
‘Αποῦ τὴν γῆν ἀνοίξασι, κέβγῃκ’ ἀποῦ τὸν Ἄδη,
Ποιὸς εἶμαι μοναχά τῶνε δίχως μιλιὰ ἔμποροῦσι
Νὰ φανερώσουν σήμερον ἔ’ ὅσους με συντηροῦσι.

Ἐγὼμαι κείνος τὸ λοιπὸν ἀπ’ ὅλοι μέ μισοῦσι
Καὶ σκυλοκάρδη καὶ τυφλὸ κᾶπονον μέ λαλοῦσι.
Ἐγὼμ’ ἀποῦ τζῆ βασιλεὺς, τζῆ ἔμπορεμένους οὔλους
Τζῆ πλούσιους κἀνήμπορους, τζ’ ἀφένταις καὶ τζῆ δούλους,
Τζῆ νέους καὶ τζῆ γέροντας, μικροὺς καὶ τζῆ μεγάλους,
Τζῆ φρόνιμους καὶ τζῆ λωλοὺς, κοῦλους ἀνθρώπους τζ’ ἄλλους,
Γιαμὰ, γιαμὰ ὄντε μοῦ φανῇ ῥίχνω καὶ θανατόνω,
Κεῖς τὸν ἀθὼ τζῆ νιότης τους τζῆ χρόνους τους τελειώνω.
Λυόνω τζῆ δόξαις καὶ τιμαῖς, τᾶνόματα μαυρίζω.
Τζῆ δικιοσύναις διασκορπῶ, καὶ τζῆ φιλιαῖς χωρίζω,
Τζ’ ἄγριαῖς καρδιαῖς καταπονῶ, τζῆ λογισμοὺς ἀλλάσσω,
Τζ’ ὀλπίδες ῥίχνω ἔ’ μιὰ μεριά καὶ τζ’ ἔγνοιας κατατάσσω.
Κέκεῖ ποῦ μέ πολὺ θυμὸ τὰ μάτια μου στραφοῦσι,

Χώρας χαλοῦν ἀλάκαιραις, κόσμοι πολλοὶ βουλοῦσι.
 Ποῦ τῶν Ἑλλήνων ἢ βασιλειαῖς ; ποῦ τῶ Ρωμίων ἢ τόσαις
 Πλούσιαις καὶ μπορεζόμεναις χώραις ; ποῦ τόσαις γνώσαις ;
 Φτωχοὶ στὸ λάκκο κατοικοῦν, βουβοὶ μὲ δίχως στόμα
 Ψυχαῖς γδυμναῖς δὲν ξεύρω ποῦ στὴ γῇ λιγάκι χῶμα.
 Ὡ πλῆσια κακορρίζικοι καὶ γιάντα δὲ θεωροῦσι
 Τζῆ μέραις πῶς λιγαίνουσι, τζῆ χρόνους πῶς περνοῦσι ;
 Τὸ χθὲς ἐδιάβη, τὸ προχθὲς πληθὸ δὲν ἀνιστορᾶται,
 Σπίθα μικρὴ τὸ σήμερο στὰ σκοτεινὰ λογαῖται.
 Ἔξεναν ἀνοιγοσφάλισμα τῶν ἄμματ' ἀποσώνω
 Καὶ δίχως λύπησι καμιά πᾶς ἄνθρωπο σκοτόνω.
 Τὰ κάλλη σβύνω, κῶμορφο πρόσωπο δὲ λυποῦμαι,
 Τοὺς ταπεινοὺς δὲ λεημονῶ, τοὺς ἄγριους δὲ φοβοῦμαι.
 Τοὺς φεύγουν φτάν' ὀγλήγορα, τοὺς μὲ ζητοῦν μακραίνω,
 Καὶ δίχως νὰ μὲ κρᾶζουσι συχνὰ τζῆ γάμους ἔμβαίνω.
 Φτωχοὶ τάρπατε φεύγουσι, τὰ σφίγγετε πετοῦσι,
 Τὰ περμαζόνετε σκορποῦν, τὰ κτίζετε χαλοῦσι.
 Σὰ σπύθα σβύν' ἢ δόξα σας, τὰ πλούτη σας σὰ σκὼνῃ
 Σκορπούσηνε καὶ χάνονται, καὶ τῶνομά σας λύνει,
 Σὰ νᾶτον μὲ τὸ χέρι σας γραμμένο εἰς περιγιάλι
 Στὴ διάκρισι τζῆ θάλασσας, γῇ χάμαι στὴν πασπάλη.

My visage fierce and pitiless, my dark and ghastly stare ;
 The sickle which I carry ; my fleshless bones and bare ;
 The lightning, with the thunder claps that shake the earth around,
 Forthbursting from the jaws of hell, and rending all the ground ;
 These things may tell you who I am : it needs no words of mine ;
 Whoso but looks on me to day, my name may soon divine.

Yes, I am he whom all men hate, and call with one consent
 Hound-hearted, blind, and pitiless, whose soul can ne'er relent.
 I spare nor kings nor potentates, the mighty of the earth,
 The master and the slave alike, in plenty or in dearth ;
 The young, the old, the great, the small, the simple and the wise,
 Whene'er I please I lay them low, never again to rise.
 Even in the flower of their youth, their fleeting years I number ;
 Glory and praise and fame I whelm in dark eternal slumber ;
 The memory of righteous deeds swift to the winds I scatter ;
 The closest bonds that friendship knits I sunder and I shatter ;

The fiercest heart I quickly tame, sage counsels I confound,
 Fair hopes I blight, and lofty thoughts lay even with the ground.
 And wheresoe'er my eyes are turned with fell destructive power,
 Whole countries sink, whole worlds decay, and vanish in an hour.
 Where is the sovereignty of Greece? where is the wealth of Rome?
 The one of mighty realms the nurse, the other learning's home.

How poor they dwell within the tomb, the dumb and voiceless dead,
 In some small corner of the earth: a sod above their head:
 Mere naked shades! Thrice wretched men! why do they not behold
 How day is dwindling after day, how soon their years are told?
 Yestreen is passed, the day before has left no trace in sight;
 To-day is reckoned but a spark in yonder realms of night.
 Swift as the twinkling of an eye, I come, and drag away
 My victims to the grave, and all without compassion slay.
 Beauty I quench, nor lovely face can draw from me a tear;
 To the meek I show no mercy, and the proud I do not fear.
 Who shun me, them I overtake; who seek me, them I fly;
 Unbidden, at the marriage feast a frequent guest am I.
 Wretches! what ye would snatch escapes, and flies while scarce
 embraced?
 Your gathered wealth is scattered soon, and what ye build effaced;
 Your glory, like a spark, is quenched; your riches as the dust,
 Dispersed and gone; quick perishes the name for which ye lust;
 Left to the mercy of the sea, as 't were, with idle hand
 Inscribed upon the sounding shore, or in the drifting sand.

Those who have read the *Æneid* of Virgil will remember how the heroes in Hades are represented by that poet as following the same pursuits below the ground which formerly they followed above it. If you would see how this notion has survived, listen to the modern Greek description of the death of Demos, a notorious klepht or robber:

‘Ο ἥλιος ἐβασίλευε κὸ Δῆμος διατάζει
 “ Ζύρτε παιδιά μου στὸ νερὸ ψωμὶ νὰ φάτ’ ἀπόψε.
 Καὶ σὺ Λαμπράκη μ’ ἀνεψιὲ κάθου ἐδὼ κοντά μου.
 Νὰ τᾶρματά μου φόρεσε νὰ ἦσαι καπιτάνος
 Καὶ σείς, παιδιά μου, πάρετε τὸ ἔρημο σπαθὶ μου,

Πράσινα κόψετε κλαδιά, στρώστέ μου νὰ καθίσω,
 Καὶ φέρτε τὸν πνευματικὸ νὰ μ' ἐξομολογήσῃ
 Νὰ τὸν εἰπῶ τὰ κρίματα ποῦ ἔχω καμωμένα,
 Τριάντα χρόνι' ἄρματωλὸς κείκοσιπέντε κλέφτης·
 Καὶ τώρα μ' ἦρθε θάνατος, καὶ θέλω ν' ἀπαιθάνω.
 Κάμετε τὸ κιβουρί μου πλατύ, ψηλὸ νὰ γένη,
 Νὰ στέκ' ὀρθὸς νὰ πολεμῶ, καὶ δίπλα νὰ γεμίζω.
 Κάπο τὸ μέρος τὸ δεξιὸ ἀφήστε παραθύρι,
 Τὰ χελιδόνια νὰρχονται τὴν ἀνοιξιν νὰ φέρουν,
 Καὶ τὰ ῥόδια τὸν καλὸν Μάϊ νὰ μὲ μαθαίνουν."

The sun was on his western throne when Demos thus commanded :
 Oh, children, get you to the brook to eat your bread at even.
 And thou, Lambrakes, kinsman mine, come near and sit beside me :
 There, take the armour which was mine, and be like me a captain.
 And ye, my children, take in charge the sword by me forsaken ;
 Cut branches from the greenwood tree, and spread a couch to rest me.
 Go fetch me now the man of God, that he may come and shrive me,
 For I would tell him all the sins that I have e'er committed,
 While thirty years a man-at-arms, one score and five a robber.
 And now to take me Death has come, and I for Death am ready.
 Then make my tomb on every side right broad and high above me,
 That upright I may stand to fight, and stoop to load my musket.
 And on the right hand side, I pray, leave me a little window,
 Where swallows in the early year may bring the spring time with
 them,
 And of the merry month of May the nightingales may tell me.

Among the ancient Greeks, Theseus, Pirithous, and
 Hercules, in addition to their other exploits, were believed
 to have descended to the nether world and returned again to
 earth. Says Virgil :

Facilis descensus Averni,
 Sed revocare gradum, superasque evadere ad auras,
 Hic labor, hoc opus est; pauci quos æquus amavit
 Jupiter aut ardens evexit ad æthera virtus,
 Dis geniti potuere.

Hercules rescued Alcestis from the hold of Death.

Similar stories are told to this day, one of which,

under the name of the *Three Braves in Hades*, I here subjoin :

Καλὰ τὰ ἔχετε βουνὰ, καλόμοιρ' εἰσθε κάμποι
 Ποῦ Χάρο δὲν παντέχετε, Χάρο δὲν καρτερεῖτε.
 Τὸ καλοκαίρι πρόβατα καὶ τὸν χειμῶνα χιόνια.
 Τρεῖς ἀντρειωμένοι βούλονται τὸν ᾄδη νὰ τσακίσουν,
 Ὅνας λέγει τὸν Μάϊ νὰ 'βγῇ, κί ἄλλος τὸ καλοκαίρι,
 Κί ὁ τρίτος τὸ χινόπωρο, ποῦ πέφτουνε τὰ φύλλα.
 Κόρη ξανθὴ τοὺς μίλησε αὐτοῦ 'στὸν κάτω κόσμον·
 ' Πάρτε μ' ἀνδρειωμένοι μου κέμἐ στὸν πάνω κόσμο.'
 ' Κόρη, βροντοῦν τὰ ρούχά σου, φυσοῦν καὶ τὰ μαλλιά σου,
 Χτυπάει καὶ τὸ καλίγι σου καὶ μᾶς νογᾶει ὁ Χάρος.'
 ' Ἐγὼ τὰ ρούχα βγάνω τα καὶ τὰ μαλλιά τὰ κόβω,
 Καὶ τὰ καλιγοπάπουτσα στὴν σκάλα τὰποθώνω.
 Πάρτε μ' ἀνδρειωμένοι μου κέμἐ στὸν πάνω κόσμο,
 Νὰ πάω νὰ διῶ τὴν μάνα μου, πῶς θλίβεται γιὰ μένα,
 Νὰ πάω νὰ διῶ τὰδέρφια μου, πῶς κλαίουνε γιὰ μένα.'
 Κόρη μ' σένα τὰδέρφια σου μὲς στὸν χορὸν χορεύουν,
 Κόρη μ' σένα ἡ μάνα σου στὴν ρούγα κουβεντιάζει.

•O well is you, ye mountains, ye fields, your lot is happy,
 That ye must not for Charon wait with trembling expectation ;
 Blest with your sheep in summer time, blest with your snows in
 winter.

Three braves determine they will break their way by force through
 Hades.

The first would fain ascend in May, the second in the Summer,
 The third in Autumn, when the leaves upon the ground are falling ;
 A maiden fair, with golden hair, beneath the earth entreats them :
 " Take me, too, with you, oh, ye braves, to breathe the air of heaven.
 " Maiden, thy garments rustle loud, thy hair doth flash like lightning ;
 Thy shoon resound upon the ground, and Charon will be on us."
 " My garments I will doff them, and cut short my golden tresses,
 And leave my shoon upon the stairs that lead our footsteps upwards.
 Take me, too, with you, oh, ye braves, to breathe the air of heaven,
 That I may see my mother, who for me is sore afflicted,
 That I may see my brethren, who for me are sadly mourning."
 " Oh, maiden, be content ; thy brethren in the dance are dancing ;
 Oh, maiden, be content ; thy mother in the street is chatting."

In all six versions of this myth which Arnold Passow has collected, this same maiden appears. In fact, the most usual title for the ballad is 'Η Κόρη εἰς τὸν Ἅδην. Here we are reminded that Κόρη was used in ancient times as a proper name, ἡ Κόρη being κατ' ἐξοχὴν, Persephone or Persephassa, Latinised Proserpine, the daughter of Demeter, Mother Earth, who is also called *par excellence*, the Mother, and is represented, as here the daughter is, with golden hair. Proserpine or Kore, according to the ancient legend, was carried off by Pluto to become his wife, and only allowed to revisit the earth at stated intervals. Plutarch sees in Proserpine a personification of the moon, carried off by the king of darkness, and periodically restored. All such metaphor is of course long forgotten before the myth could have assumed its modern, or perhaps even, its classical form.

The idea of being married to Hades, however, still survives. Listen to the following dialogue between parents and a dying daughter :

“ Κόρη μ' αὐτοῦ ποῦ βούλεισαι νὰ καταβῇς στὸν ἅδη,
 Αὐτοῦ πετεῖνας δὲν λαλεῖ, κόττα δὲν καρκαριέται,
 Αὐτοῦ νερὸ δὲν βρίσκεται, χορτάρι δὲν φυτρώνει.
 Ὅντας πεινᾷς δὲν γεύεσαι, ὄντας διψᾷς δὲν πίνεις,
 Κόντας θέλεις νὰ κοιμηθῇς τὸν ὕπνο δὲν χορταίνεις.
 Κάθου κόρη στὸ σπῖτι σου, κάθου στὰ γονικά σου.”
 “ Δὲν ἔμπορῶ, πατέρα μου, μητέρ' ἀγαπημένη.
 Ἐψὲς ἐγὼ παντρεύθηκα · ἐψὲς ἀργὰ τὸ βράδυ·
 Ὁ ἅδης εἶν' ὁ ἄνδρας μου, ἡ πλάκ' ἡ πεθερά μου.”

“ Oh daughter mine, there whither thou art going down to Hades,
 There is no voice of singing-bird, nor barn-door fowl that cackles;
 There water is not to be found, nor grass green blade will sprout there.
 When thou art faint thou shalt not eat, nor drink when thou art thirsty;
 And wouldst thou lay thee down to rest, thy sleep shall ne'er be sated;
 O daughter, bide at home with us, bide safe beside thy parents.”

“ I cannot bide, dear father mine, I cannot, dearest mother;
 Yestreen I donned the wedding ring, yes late yestreen I married;
 And Hades is my husband's name, the grave my kin by wedlock.”

Among the tortures of the under world with which the old Greeks were familiar, was that of being devoured by a vulture. So Ulysses, in the *Odyssee*, describes the fate of Tityos :

Καὶ Τιτυὸν εἶδον γαίης ἐρικυδέος υἱὸν
 Κείμενον ἐν δαπέδῳ, ὃ δ' ἐπ' ἐννέα κεῖτο πέλεθρα.
 Γῦπε δέ μιν ἐκάτερθε παρημένῳ ἥπαρ ἔκειρον
 Δέρτρον ἔσω δύνοντες · ὃ δ' οὐκ ἀπαμύνετο χερσίν.

Tityos, too, I there beheld, of glorious earth the child,
 Outstretched upon a level plain nine acres long, he lay ;
 While vultures twain on either side upon his liver preyed,
 Piercing the caul ; his helpless hands in vain to ward them strove.

In like manner, a bird that comes with tidings from the under world is thus described in a modern Greek ballad :

Ἐνα πουλάκι ξέβγαυνεν ἀπὸ τὸν κάτω κόσμον
 Εἶχε τὰ νύχια κόκκινα καὶ τὰ φτερά του μαῦρα,
 Τὰ νύχι 'ἀπὸ τὰ αἵματα καὶ τὰ φτέρ' ἀπ' τὸ χῶμα.

A little bird came from below, the under world forsaking,
 His claws are purpled o'er with blood, black with the earth his
 pinions.

The rivers of Death, Acheron, Styx, and Lethe, are still remembered with the modern Greeks, and that in such a manner that we can see that Charon's ancient office of ferryman still remains, on whomsoever it may have now devolved. Listen to the widow's lament :

Ἐμέ, μοῦ πρέπουν κλάμματα, δάκρυα καὶ μυριολόγια,
 Νὰ κλαίω τὸ βράδυ σιγανὰ καὶ τὴν αὐγὴν γεμάτα,
 Καὐτοῦ στὰ ξημερώματα νὰ σέρνω μυριολόγι.
 Κλάψετε μάτια μ' κλάψετε νὰ σύρετε ποτάμι,
 Νὰ γένη λίμνη καὶ γιαλὸς, νὰ πάη στὸν κάτω κόσμον,
 Γιὰ νὰ βρεχοῦντ' οἱ ἄβρεχοι, νὰ πιοῦν οἱ διψασμένοι·
 Νὰ βάλουν κοί γραμματικοὶ νερὸ στὸ κυλαμάρι,
 Νὰ γράψανε τὰ βάσανα τῶν πολυαγαπημένων
 Ὅπου περνοῦν τὸν ποταμὸ καὶ πίνουν τὸ νερό του,
 Καὶ λησμονοῦν τὰ σπίτια τους καὶ τὸρφανὰ παιδιὰ τους.

Me moaning well beseems, and tears and dolorous lamentation,
 Softly to weep at eventide, and loudly in the morning ;
 And even at the break of day to utter voice of wailing.
 Weep, weep, mine eyes, weep bitterly, till tears run down a river ;
 To make a lake and eke a shore, to nether world descending.
 That those parched souls may moisture find, and drink may cheer the
 thirsty,
 And men in letters skilled may put some drops in quills for writing,
 To write the torments of the loved, the sorrows that afflict them ;
 Those dear ones who have passed the stream, and quaffed from out its
 waters,
 And straight forget their house and home and all their orphaned
 children.

Here plain enough is Lethe in fact, if not in name. But the river of Death best known to the Greeks of to-day is one which goes by the name of Salambrias, and appears to be a river in Thessaly, the same as the ancient Peneus.

It is not like Lethe so much, the river of Forgetfulness, as one that bears along the dead upon its tide.

Ἀπόψε τὶ μ' ἐπόνεσε τὴ μαύρῃ τῇ καρδιά μου
 Καὶ ξύπνησα κέρωτησα, πάλι ξαναρωτῶ την
 "Καρδιά μου τέχεις καὶ πονεῖς καὶ βαρυαναστενάξεις ;
 Εὐὸ βαρέμι δὲν βαστᾷς, βουνὸ δὲν ἀναβαίνεις."
 "Κάλλιο νᾶνέβαινα βουνὸ, βολύμι φορτωμένη,
 Παρὰ τὸ θαῦμα ποῦδ' ἐγὼ ἐψῆς ἀργὰ τὸ βράδυ.
 Δυὸ ἀδέρφια σέρνει ὁ ποταμὸς μὲ τὸ φιλὶ πλεγμένα,
 Κῆνας τὸν ἄλλον ἔλεγε κῆνας τὸν ἄλλον λέγει,
 'Βάστ' ἀδελφέ μου, βάστα με, νὰ μὴ 'ποχωριστοῦμε,
 Ἀνίσως καὶ χωρίσωμε, δὲν μετασμίγομ' ἄλλο.'"

To-night my heart did pain me, poor heart, while yet I slumbered,
 And starting up I asked my heart, and once again I asked it :
 "Tell me, my heart, thy trouble and the cause of thy deep sighing ;
 Thou bearest no sore burden now, no mountain side thou scalest."
 "Ah, better far the mountain side, though I with lead were laden,
 Than the weird vision that I saw yestreen as night was falling —
 A river bearing on its tide two brothers close embracing,
 And thus one to the other said, yes thus he still keeps saying,

' Oh brother, brother, clasp me tight, let nothing us dissever,
If haply we should parted be, we meet no more for ever.' "

Those who have read the *Odyssee* and Tennyson's *Lotus Eaters*, will remember that oblivion may be brought about by the herbs of the field, as well as by the waters of a river. Let us see how this notion still survives in the superstition of the λησμοβότανον, or herb of forgetfulness :

Πέρα σ' ἐκεῖνο τὸ βουνὸ
'Οπῶχ' ἀντάρα στὴν κορφή,
Καὶ καταχνιὰ στὸν πάτο,
'Εκεῖν' τὸ λησμοβότανο.
Τὸ τρῶνε προβατίναις
Καὶ λησμονοῦν τὰρνία των.
Σύρε καὶ σὺ μανοῦλά μου,
Νὰ μὲ ἀλησμονήσης.

On yonder mountain far away,
That wears the tempest on its brow,
There grows the herb " Forgetfulness."
The shepherdesses eat it,
And straight forget their lambkins
Go thither then, my mother,
And me no more remember.

To return for a moment to Charon and his realm. Charon is so much a real person with the modern Greeks, that we hear not only of his mother but also of his son, though their names are never mentioned. As for his wife, if it be not the Κόρη above noticed, I fear, like his colleague Ἄδης, he is a terrible polygamist. One name for the dead in modern Greek is οἱ πολλοί, an exquisite euphemism, " the many." The dead are so vividly believed to be beneath the ground that they can frequently be heard from their tombs :

Τί ἔχεις μνήμα καὶ βογγᾶς καὶ βαρυναστενάξεις ;

What ails thee, tomb, that from thy depth such groans and sighs do
issue?

is the question of a passer-by who has heedlessly trodden on a hero's grave.

The Nereids, or water nymphs (*νερὸν* is modern Greek for water), who carried off Hylas, the son of Hercules, are still to be found in Greece.*

*Καὶ στὸν ἀπάνω ποταμὸν μὴ παίξης τὸ περνιαῦλι,
Κέρθουν καὶ μονομαζεῦθουν τοῦ ποταμοῦ νεράιδες.*

And by the upper river's bank, beware thy flute of piping,
Lest haply river fairies come, and gather them around thee.

Circe, the sorceress, is also to be found to all intents and purposes with a tincture of Medea and Calypso. Witness the following lament of a traveller who has fallen beneath the spell of her enchantments :

*Πῆρα χήρας θυγατέρα καὶ τῆς μάγισσας,
Ποῦ μαγεύει τὰ ποτάμια, καὶ δὲν σύρνουνε,
Καὶ ταῖς θάλασσαις μαγεύει, καὶ δὲν ἀρμενοῦν,
Καὶ μαγεύει καὶ ταῖς βρύσσαις, καὶ δὲν ρέουνε,
Καὶ μὲ μάγεψε κ' ἐμένα καὶ δὲν ἔρχομαι
Ὅτανε βουλιῶμαι νᾶρτω, χιόνια καὶ βροχαῖς,
Ὅτανε γυρίξω πίσω, ἥλιος ξαστεριά.*

I wed the daughter of the widowed sorceress,
Who bewitches all the rivers that they flow no more ;
Who bewitches all the seas that none can sail thereon ;
Who bewitches all the fountains that their streams are stayed ;
Who me bewitches also, that I come no more.
When I would come, the heavens are dark with rain and snow,
When I turn backward, brightly shine the stars and sun.

Observe here, moreover, another modern Greek antiquity ; the old trimeter iambic catalectic measure with accentual in place of quantitative scansion.

The ancient *δαίμονες*, or genii, appear in the modern *στοιχεῖα*. This word *στοιχεῖον* means in classical Greek the

* The only difference being that the Nereids among the modern Greeks are fresh water-fairies ; the Naiads, rather than the Nereids of antiquity.

shadow of the sun dial ; but this was likely enough only a technical limitation of a popular usage ; στοιχεῖον is literally that which moves ; and as all shadows move, they would naturally be called στοιχεῖα. I have discussed the history of this word at length in my book on *The Modern Greek Language in its Relation to Ancient Greek*. Oxford, 1870, pp. 200–203. Since I wrote the essay referred to, I have received abundant confirmation of my view of the connection between the στοιχεῖα, or elements of Empedocles (see also the στοιχεῖα of St. Paul), and the genii = ancient δαίμονες.

Plutarch, *De Cessatione Oraculorum*, chap. 10, distinguishing between Θεοὶ and Δαίμονες, gods proper and genii, observes, “ Well do they say, who maintain that Plato, by discovering the στοιχεῖον that underlay the various qualities of the things that are continually coming into being, rescued philosophers from many serious dilemmas ; but I think that they disposed of more, and of more serious ones, who discovered the race of genii, δαίμονες, midway between gods and men.” Here plainly enough the genii are so many στοιχεῖα, opposed to nature and matter as a single στοιχεῖον. The original δαίμονες were always beneficent, or at least only vengeful of wrongs ; but in Plutarch’s time, as now, they were a mixed kind, having, as he says, the passions of men and the power of God. They were of old in many cases the souls of the departed, inhabiting the forms of plants, or birds, or beasts ; so too to day. Like Daphne of old, so now, the bulrush and the cypress are instinct with a half-suppressed vitality.

Ἐκεῖ ποῦ θάψανε τὸν νιὸν, ἐβγῆκε κυπαρίσσι·
 Κέκεϊ, ποῦ θάψανε τὴν νιά, ἐβγῆκε καλαμιῶνας.
 Κι’ ὄντας φυσάει ὁ κὺρ βοριάς, σκύφτει τὸ κυπαρίσσι,
 Κι’ ὄντας φυσάει ὁ ζέφυρος, λυγίζ’ ὁ καλαμιῶνας.
 Γιά δὲς τὰ τὰ λιγόζωα, τὰ λιγοζωημένα.
 Ποῦ ἄν δὲ φιλιοῦνται ζωντανὰ, φιλιοῦνται πεθαμμένα.

There where the youth they buried, there the cypress tree appeareth ;
 There where the maid they buried, there sprouted forth the bullrush ;
 And when Lord Boreas blows a blast, then bows the stately cypress ;
 And when the breath of Zephyr blows, the supple bullrush bendeth.
 Behold them with their little life, the little life still left them ;
 What though they kissed not when they lived, they kiss in death
 united.

To those who are pleased to observe the narrow boundary that separates the sublime from the ridiculous, it may be gratifying to compare the following lines from the English ballad of " Y^e Lord Lovel and y^e Lady Nancy Gray " :

And out of her bosom there grew a red rose,
 And out of Lord Lovel's a briar,
 And they twined themselves into a true-lover's knot,
 For all true lovers for to admire.

The belief in fascination, *βάσκαμμα*, by means of the evil eye, is as rife now as in the days of Theocritus. Witness the following line :

Νὰ μὴ σὲ πιάνη βάσκαμμα καὶ τὸ κακὸ τὸ μάτι.

May no spell overtake thee, nor the evil eye bewitch.

To turn to some other mythological personages, let me read you these lines descriptive of Digenes, " the Twice Born," who reminds us of the ancient Zagreus, killed by Here and born again from Semele, under the name of Dionysus. As Dionysus appears in later times in the character of Bacchus, we can only conclude that according to some legends he was born not twice only, but three times ; and that is precisely the case with Digenes in modern Greek, who, in spite of his name, is a thrice-born giant.

It is true the fabulous record only says : " A third [day] Digenes was born, a third [day] he will die ;" and this would mean in common parlance, " on a Tuesday ;" but taken in conjunction with the unquestionable etymology

of the name Digenes, "the Twice Born," my interpretation of τρίτη,* as equivalent to thrice seems not unreasonable. However, my hearers may judge for themselves.

Τρίτ' ἐγεννήθη ὁ Διγενῆς, τρίτη θὲ νὰ πεθάνῃ·
 Στέλνει, φέρνει τοὺς φίλους του, ὅλους τοὺς ἀντρειωμένους·
 Νάρθη ὁ Μηνᾶς, ὁ Μαυραῖλῆς κί' αὐτὸς ὁ υἱὸς τοῦ Δράκου,
 Κέπηγαν καὶ τὸν ἡῦρανε στὸν κάμπο ξαπλωμένο·
 Βογγάει, τρέμουν τὰ βουνὰ, βογγάει, τρέμουν οἱ κάμποι.
 " 'Σὰν τί νὰ σ' ἡῦρε Διγενῆ καὶ θέλεις νὰ παιθάνῃς ;"
 " 'Ογδῶντα χρόνους ἔζησα εἰς τὸν ἀπάνω κόσμον,
 Κἀνένα δὲ φοβήθηκα ἀπ' τοὺς ἀνδρειωμένους·
 Τώρ' εἶδα 'να 'ξυπόλυτο καὶ λαμπροφορημένο·
 Φορεῖ τοῦ ἡλίου τὰ μαλλιά, τῆς ἀστραπῆς τὰ μάτια·
 Μὲ κράζει νὰ παλέψωμε στὰ μαμαρένι' ἀλώνια·
 Κι' ὅποιος νικήσ' ἀπὸ τοὺς δυὸ νὰ παίρῃ τὴ ψυχὴ του."
 Κέπηγαν κέπαλέψανε στὰ μαμαρένι' ἀλώνια·
 Κι' ὅθε χτυπάει ὁ Διγενῆς τὸ αἷμ' αὐλάκι κάνει
 Κι' ὅθε χτυπάει ὁ Χάροντας, τὸ αἷμα τράφο κάνει.

A third day Digenes was born, a third day he must perish ;
 He sends and gathers all his friends, the valiant ones, around him ;
 Menas must come, and Mayrailes, and eke the dragon's offspring ;
 They came, and found his giant limbs wide o'er the plain extended.
 He groans, and all the mountains shake, he groans, the plains are shaken ;

" What hath befallen Digenes, that thou shouldst think to perish ?"
 " For eighty years I now have walked this upper world, and never
 Yet feared I any upon earth of all the giants living ;
 To-day a mighty one I saw, bare foot, in shining raiment,
 He wore the sun's resplendent locks, his eyes the lightning lent him.
 Upon the marble threshing floors he challenged me to wrestle,
 And of the two who conqueror proves the other's life shall ravish."
 Upon the marble threshing floors the two repaired to wrestle ;
 At every blow from Digenes blood flowed, and filled a furrow,
 At every blow which Charon gave, a dyke with gore was flooded.

The "son of the dragon" has a very mythological sound.
 In other version, one of Digenes' companions is called

* *Subaudizo* φορὰ οὐ ἡμέρα.

Τρεμαντάχειλος, a kind of modern Ερεισίχθων, “ποῦ τρέμει ἡ γῆ κι ὁ κόσμος.” The age of Digenes is elsewhere reckoned at three hundred years, which, compared with the single life of eighty here ascribed to him, strengthens the supposition of his having been thrice born. He there appears as a kind of immortal, who only died because he wounded a stag sacred to the virgin (Mary, or Artemis?). Truly there were giants in those days.

Another mythical hero, Porphyres, who seems in respect of his wonderfully precocious development to have been a second Hermes, of whom the Homeric hymn declares—

Ἦϕος γεγονὼς μέσφ' ἡματι ἐγκιθάριζεν·
Ἑσπέριος βοῦς κλέψεν ἐκηβόλου Ἀπόλλωνος.

Born in the morning, by midday he learnt to play the lyre,
At eventide the oxen stole of far darting Apollo.

Καλόγρια γιὸν ἐγέννησεν κε ἀπάνω στὸ πορφῦριν,
Κι' αὐτὸν πορφῦρ' καλέστ' αὐτὸν κι' αὐτὸν πορφῦριν πέτε·
Μονόημερος ἐγένετον κῆφαγεν τὸ φουντάρι·
Διήμερος ἐγένετον, φάγεν ἀρνὶν καὶ πρόβαν,
Πεντήμερος ἐγένετο κέξέβεν καὶ καυχέθεν.
κ. τ. λ.

Here it is related of Porphyres, that when one day old he ate a plant, at two days a sheep and a lamb, on the fifth day he walked forth and boasted that he loved twenty married women and eighteen widows, besides the daughter of a priest whose hand he had chopped off. At the king's command, he is bound while asleep and brought to Constantinople, with his hands tied behind his back, ἐξάγκωνα δεμένο. But a shake of his shoulders suffices to shatter his fetters in a trice, and he makes off with the bride of his choice. He seems quite to belong to the Samson and Hercules cycle of legends, in which moral distinctions are lost sight of in admiration of mere brute force, however mischievously and wantonly displayed.

The *Λάμια*, or bugbear, mentioned by Aristophanes (*Vespæ* 1177), still survives under the same name in Greece ; and, like the Satyr, who according to Xenophon flayed Marsyas, after overcoming him in a musical contest, so this Lamia challenges the unwary shepherd to a trial of lungs on the pastoral pipe ; and after the two have piped three days and three nights against each other, the shepherd at last gives in, the Lamia appropriates his flocks, and sends him to keep sheep for somebody down stairs. The mythological nature of this tale further appears, from the fact that the hapless hero is the youngest of three brothers, who are called the three "elements" of the universe.

Πέντε χιλιάδες πρόβατα, δέκα χιλιάδες γίδια
Τὰ φύλαγαν τρεῖς ἀδελφοί, κοί τρεῖς στοιχεῖα τοῦ κόσμου.

Of this anon.

Most of us have read the story of Atreus inviting his rival, Thyestes, to a banquet on his own son. This feast of horror is renewed in modern Greece by faithless wives, who cut up and boil their children to prevent them from telling tales, but to so little purpose that the morsels thus address the outraged husband and father :

If thou art a Turk, then eat me ; if a Hebrew, then destroy me ;
But if thou art my father, then bend to me and kiss me.

The vengeance is prompt, for the injured spouse and parent cuts up his wife, and grinds her in a mill, singing a song the while :

Ἄλεσε μύλα μ' ἄλεσε, ἄλεσε μαῦρα μάτια,
Ἄλεσε χεῖλη κόκκινα κῆνα χρυσὸ κορμάκι,
Βγάνει τάλεύρια κόκκινα, τῇ πάσπαλῃ μελάνῃ.

Grind, mill, O grind, and grind amain ; grind two black shining eyes,
Grind crimson lips, and body bright and fair as burnished gold ;
It grinds the lips to crimson meal, the eyes to bran as black.

No doubt this mill song, which occurs in various forms in different versions, is the origin of many legends which help to solace women labouring at the mill, and remind them at the same time of the virtue of conjugal fidelity. Somewhat similar in accentual rhythm and sound is the ancient mill-song preserved to us by Herodotus, which records the *grinding* tyranny of Pittacus, Prince of Mitylene:

Ἄλει μύλα, ἄλει, καὶ γὰρ Πιττακὸς ἄλεί
Τὰς μεγάλας Μιτυλάνας τυραννεύειν.

Grind, mill, grind, for Pittacus is grinding,
Pittacus, the tyrant of mighty Mitylene.

Σκύλλα, Scylla, is a frequent name for these female monsters. Who does not remember the Scylla of ancient Greece, who cut from her father's forehead the lock on which his safety hung, in order to betray him to Minos, with whom she was in love?

Nisus and Scylla were both changed into birds, as Daphne was changed to a laurel, Tereus to a hoopoe, Philomela to a nightingale, and Procne to a swallow. Similarly in Zakynthos we find a Romaic rhyme, in which a maiden, persecuted by a Turkish suitor, says to her mother:

Χελιδόνι γένομαι, τὰ δάση πέρνω·

To a swallow I 'll turn, to the woods I 'll betake me.

To which the mother, who favours the suit, replies:

Μάτια μου κἂν γένῃς κι' ὅτι κἂν κάνῃς,
Κυνηγάρῃς γένηται καὶ μοῦ σὲ πιάνει.

Whate'er you become, and whatever you do,
He 'll turn to a hunter and soon catch you.

While we are on the subject of swallows, I must redeem a promise made on a former occasion.

The *chelidonisma*, or custom of singing the advent of the swallow, practised in ancient times by boys in Rhodes as a means of begging, has now become common in many parts of Greece. We compare the following lines from the ancient and modern versions :

Ἦλθ', ἦλθε χελιδών

Καλὰς ὥρας ἄγουσα

Καλούς ἐνιαυτούς,

* * * *

Παλάθαν σὺ προκύκλει

Ἐκ πίονος οἴκου,

Οἴνου τε δέπαστρον,

Τυρῶν τε κάνυστρον·

Καὶ πύρνα χελιδών

Καὶ λεκιθίταν

Οὐκ ἀπωθείται.

ANCIENT.

The swallow has come, the
swallow has come,
Bringing fair weather, 'fair
seasons along.

Trundle out your damson
cheese

From your full store at
home.

Let 's have a glass of wine,
if you please,

Besides a basketful of cheese,
In payment for our song.

'T is that we 'd choose ;

But wheaten cakes,

And sundry bakes,

The swallow won't refuse.

Ἦρθεν, ἦρθε χελιδόνα

* * * *

Καλοκαίρι θὰ μυρίσης,

Πάλιν ἀνοιξιν θ' ἀνθίσης

Σὺ καλὴ οἰκοκυρὰ

Ἐμπα στὸ κελλάρι σου

Φέρ' αὐγὰ περδικωτὰ,

Καὶ πωλιὰ σαρακωστά·

Δόσε καὶ μὲν ὀρνιθίτσαν·

Φέρε καὶ μὲν κουλουρίτσαν.

MODERN.

The swallow has come, the
swallow has come,
With scent of summer and
flowers of spring.

Into your cellar good house-
wife go,

Partridges' eggs from thence
to bring,

And Lenten chickens,

And such like pickings,

Not to mention a roll or so.

This is perhaps hardly mythological, but I have no other heading for it, and it certainly belongs to the general subject

of modern Greek antiquities. The nursery rhymes of modern Greece are doubtless of a hoary age; so like our own, yet at the same time so independent of them, that we feel that both theirs and ours must be a common heritage from an ancient indogermanic stock, variously modified by national colouring. Listen to the Greek version of "The house that Jack built." "There was an old man, and he had a little bird that made a noise and woke the poor old man, then came a cat and ate the bird," etc., "then came a fox and ate the cat," etc., etc., "then came a wolf and ate the fox," etc., etc., etc., "then came a lion that ate the wolf," etc., etc., etc., etc., "then came a river and carried off the lion that ate the wolf," etc., etc., etc., etc., etc. It is no good writing out the whole; all the words occur in the last verse.

Κῆλθεν ἕνας ποταμὸς, πῆρε τὸν λέοντα, ποῦφαγε τὸν λύκον, ποῦφαγε τὴν ἀλωπούν, ποῦφαγε τὸν πετεινὸ ποῦ λάλει καὶ ξύπνα τὸν μαῦρο τὸν γέρον.

In another cradle song, we have a reference to the old Persian custom of supplying court favourites with their several luxuries from various satrapies, mentioned by Plutarch in his life of Themistocles.

Lullaby, lullaby, my little son,
My darling, my treasure, my brave little one;
Alexandria for sugar,
Misiri for rice,
And Constantinople
For years told thrice
To rule and to reign,
And three others again;
Three convents too,
And all for you;
The towns to play in,
The convents to pray in.
Won't that be nice?

Another nursery rhyme sufficiently demonstrates the personality of Boreas, the North Wind; for whether Æolus be his father or no, it is certain he has a mother:

Νὰ μοῦ τὸ πάρης ὕπνε μου· τρεῖς βίγλαις θὰ τοῦ βάλω·
 Τρεῖς βίγλαις, τρεῖς βιγλάτοραις, κοί τρεῖς ἀνδρειωμένοι·
 Βάλλω τὸν ἥλιον στὰ βουνὰ, τὸν αἰτὸν στοὺς κάμπους·
 Τὸν κύρ Βοριά τὸν δροσερὸν ἀνάμεσα πελάγου.
 Ὁ ἥλιος ἐβασίλευσεν, αἰτὸς ἀπεκοιμήθη,
 Καὶ ὁ κύρ Βοριάς ὁ δροσερὸς στῆς μάνας του ὑπάγει.
 “Υἱέ μου ποῦσουν χθές, προχθές; ποῦσουν τὴν ἄλλην νύχτα;
 Μῆνα μὲ τᾶστρη μάλωνες; μῆνα με τὸ φεγγάρι;
 Μῆνα μὲ τὸν αὐγερινὸ ποῦμεστ’ ἀγαπημένοι;”
 “Μήτε μὲ τᾶστρη μάλωνα, μήτε μὲ τὸ φεγγάρι,
 Μήτε μὲ τὸν αὐγερινὸ ὁποῦστ’ ἀγαπημένοι·
 Χρυσὸν υἱὸν ἐβίγλιζα στὴν ἀργυρῇ του κούνια.”

Take sleep! my child; a triple watch I set—
 A triple watch, three watchmen, all stout hearts;
 The sun on the hill, the eagle in the fields,
 And cool Sir Northwind amid ocean waves.
 The sun went down, the eagle fell asleep,
 And cool Sir Northwind to his mother hies.
 “Where wast thou yesterday, my son, and where
 The day before; and where the other night?
 Fighting the stars, or buffeting the moon,
 Or else the morning star, who is my love?”
 “Neither with moon, nor stars, nor morning star,
 Thy love, have I been fighting; only watching
 A golden boy in silver cradle rocked.”

The three Fates, Atropos, Lachesis, and Clotho still preserve their number, if not their name.

Στὸν Ὀλυμπον στὸν κόλυμπον,
 Τὰ τρία ἄκρα τοῦρανοῦ·
 Ὅπουν’ αἱ μοῖραι τῶν μοιρῶν,
 ὦ ἰδιά μου μοῖρα!
 Ἄς ἔλθῃ τώρα νὰ μὲ δγῇ.

Upon Olympus' summit,
 Upon Olympus' brow,
 Where at each of heaven's three corners
 The fates of fates sit now.
 Oh, fate that is for me.
 May I my true love see.

Irenæus said there must be four Gospels, because there were four corners to the earth. The modern Greek seems to think there must be three fates, because, forsooth, there are three (!) points of the compass. See above, where we had three *στοιχεῖα* in place of Empedocles' four. Truly, in matters of popular science, Greece seems to have "progressed back'ards," to use the American's felicitous expression.

While we are on the subject of Fate, may I read you two short extracts from two Cretan poets, Vincentius Cornaros and Chortakes? The first shows that the spinning-wheel of the Fates is not forgotten.

Τοῦ κύκλου τὰ γυρίσματα ποῦ ἀναιβοκαταιβαίνουν,
 Καὶ τοῦ τροχοῦ πῶραις ψηλὰ, κῶραις στὰ βάθη πηαίνουν,
 Καὶ τοῦ καιροῦ τὰ πράγματα, ποῦ ἀναπαῦμὸ δὲν ἔχουν,
 Μὰ στὸ καλὸ, κεῖς τὸ κακὸ, περιπατοῦν καὶ τρέχουν·
 Καὶ τῶν ἀρμάτων ἢ ταραχαῖς, αἱ χρήταις καὶ τὰ βάρη,
 Τοῦ ἔρωτος ἢ ἐμπόρεσες, καὶ τῆς φιλιᾶς ἢ χάρι,
 Αὐτάνα μ' ἐκινήσασι τὴν σήμερον ἡμέραν
 Νάναθηβάλω καὶ νὰπῶ τὰ κάμαν καὶ τὰ φέραν.

The ups and downs of Fortune's wheel, whose ceaseless circling motion
 Now scales the heights of heaven above, now sounds the depths of
 ocean,

With all the changing things of time; whose current, resting never,
 For worse, for better, fast or slow, is stealing on for ever;
 The troublous din of armed hosts, war's train of want and sadness,
 The ways and means of desperate love, the charm of friendship's
 gladness;

These things have moved me to recount and publish, as I may,
 The fortunes and the deeds of men, while it is called to-day.

Κἂν εἶναι κάποκότησα χάρισμα νὰ σου δώσω,
 Ἄξιο καθὼς ἐτύχαινε, καλὰ δὲν εἶναι τόσο,
 Τῆς τύχης δὸς τὸ φταίσιμο, κῶχι τοῦ θελημάτου·
 Γιατὶ ψηλαῖς τζῇ πεθυμαῖς πᾶσα καιρὸν ἐκράτου·
 Μὰ κείνη χάμαι τζ' ἔρριξε, καὶ τὰ φτερὰ που σώνα
 Ὡς ὅρος νὰ μ' ἀναιβάσουσι ψηλὸ ποῦ τέλικῶνα,
 Μοῦ κόψ', ὄντ' ἀρχήσασι καὶ χαμηλοπετοῦσα·
 Κῆ ὄρεξι μ' ἀπόμεινε μόνο σὰν πρῶτας πλοῦσα.
 Κἀντὶς τὰ θάρρειε κέλπιζε. κῆδειχνε, κῆτασσε μου,
 Κεῖς τζ' οὐρανοὺς συχνότατα τὸ νοῦν ἀναίβαζε μου·
 Μοῦ κτίζει πύργους στὸ γιालὸ, περβόλια στὸν ἀέρα,
 Κῶτι τὴν νύκτα μεριμνῶ, χάνεται τὴν ἡμέρα.

But if the greeting which I bring shall haply chance to be
 More worthy of my rash resolve than it is worthy thee,
 Oh blame my fortune for the fault, and not my will, I pray;
 My heart would ever fain be borne on soaring wings away,
 But Fortune casts it to the ground, and clips the pinions spread
 To bear me high as Helicon, to some tall mountain's head;
 Even as they begin their flight, and skim above the ground,
 Barren desire remains, as when I first was outward bound;
 And now, in place of all she weened and hoped and showed and taught,
 Moving my soul to lofty flights upon the wings of thought,
 She builds me castles in the sand, and gardens in the air;
 And what by night I meditate, day finds no longer there.

Even Zeus himself, in his fourfold Homeric character of
 Ζεὺς νεφεληγερέτης, the gatherer of clouds; ὑέτιος, the sender
 of rain; βρονταῖος, the thunderer; and ὄρκιος, or ratifier of
 oaths, appears, though without his name, in the following
 amatory distich:

Ἐγ' ἀγαπῶ σε μὰ τὸ ναὶ ὁ κύριος τὸ κατέχει!
 Ἐκεῖνος ὅπου συννεφιά καὶ ἀποβροντᾶ καὶ βρέχει.

By God's own temple thee I love, bear witness if I lie,
 That Lord who sendeth clouds and rain and thunder from the sky.

The suppressed polytheism implied in ἐκεῖνος, "that
 Lord," as if there might be others, is worthy of notice.

Before I bring these remarks to a close, I will glance at another kind of Antiquities in Modern Greek, which might perhaps with most propriety be placed under the head of "modern antiquities"; I speak of modern Greek imitations of ancient Greek writers, in which Christopulos, the modern Anacreon, was the most successful. He was a native of Kastoria in Macedonia. The first example I shall entitle "An Apology for Grey Hairs."

Νὰ ἡ τρίχες σου ἀρχίζουν,
'Αθανάσιε, γὰσπρίζουν!

Νὰ δακρύων ἐποχή!
Νὰ σὲ λέγει καὶ ὁ Ἔρως
"Φίλε πλέον εἶσαι γέρωσ
Στὸ ἐξῆς καλὴ ψυχή."

Τὴ νεότητα χαιρέτα·
Τὰ φιλήματ' ἄφησέ τα·
Ξέχασέ τα παρευθύς·
Καὶ ἀρχίνα μὲ ὑγεία
Τὰ πικρὰ τὰ γερατεῖα
Στὸ ἐξῆς νὰ τὰ γευθῇς·

Δὲν σὲ πιάνουν τὰ λουλούδια,
Δὲν σὲ πρέπουν τὰ τραγούδια·
Πῇγ' ἐκεῖνος ὁ καιρός·
Τώρα τάφος πλησιάζει,
Τώρα θάνατος φωνάζει,
Τώρα Χάρος λυπηρός!

Lo thy locks, as time is going,
Athanasius, grey are growing!

Lo the period of tears!
Lo, e'en Love to thee is cry-
ing,
"Dear good soul, there 's no
denying
Thou art getting on in
years."

Bid farewell to youthful glad-
ness;
Kisses now to thee are mad-
ness;
So forget them once for all.
Of old age, while strength is
left thee,
Ere of health it has bereft thee,
Taste the wormwood and
the gall.

Lays of love, and wreaths of
flowers,
Ill beseem thy waning powers;
No; the day for them is
past.
Now the nearer grave appals
thee,
Now pale Death approaching
calls thee,
Now grim Charon comes
at last.

Ὅθεν πλέον ἐτοιμάσου,
 Ῥῆξε δλα τὰ καλά σου·
 Πὲ τὸν κόσμον ἔχε γειά
 Καὶ τὰ δάκρυα βάστα μόνον
 Εἰς τὴν λύπην κεῖς τὸν
 πόνον·
 Μιὰ μικρὴ παρηγοριά!

Πὰ! ἡ τρίχες μ' ἂν ἀσπρί-
 ζουν,
 Μήπως τάχατε πικρίζουν;
 Τί ἔχ' ἡ ἄσπρα τοὺς βαφή;
 Τοιγὰρ τ' ἄσπρο θανατόνει;
 Ἡ φιλῶντας ἀγκυλόνει
 Τὰ χειλάκια στὴν ἀφή;

Τὸ τραντόφυλλό μας, πρῶτον,
 Τὸ λουλούδι τῶν ἐρώτων,
 Εἶναι ἄσπρο καθαρό.
 Καὶ τὸ κόκκινο ἡ φύσις
 Τὸ συγκέρασεν ἐπίσης
 Μ' ἓνα χρῶμ' ἄσπρου-
 δερό.

Ἡ μυρτιά τῆς Ἀφροδίτης
 Εἰς τὸ πράσινο κλαδί της
 Μέσ' εἰς τὰ φύλλα τὰ
 χλωὰ

Ὅλα κάτασπρα σὰν χιόνι
 Τὰ λουλούδια της φυτρώνει.
 Τὰνθὴρὰ καὶ τρυφερά.

Καὶ ὁ Δίας ὁ μέγας
 Γιὰ τῆς Λήδας τοῦ τὸ κάλλος
 Κύκνος γίνκε μιὰ φορά.

Therefore hasten to prepare
 thee;
 Let life's sweets no more ensnare
 thee,
 Bid the world good-bye,
 and rest;

All thy tears and all thy weep-
 ing,
 For real pain and anguish
 keeping,

Scanty solace at the best!
 Pooh! what though my locks
 do whiten,
 Think you that my soul can
 frighten?

What's the harm of snowy
 hue?
 Say if that destruction bringeth,
 Or the lips of lovers stingeth?
 Why this terrible ado?

Look you how the loveliest
 roses,
 Very gems in Cupid's posies,
 Are as white as white can
 be.

And though they be red, as
 often,
 Yet their tint does Nature soften
 With pale dashes equally.

Then the myrtle, dear to
 Venus,
 Notwithstanding all its green-
 ness,

Mid its verdant foliage.
 White as snow on leafy bowers,
 Shooteth forth its tender flowers,
 Types of a luxuriant age.
 Mighty Zeus once took occasion
 Of fair Leda's fascination,
 Even to become a swan.

Νάποδείξ' εἰς κάθε μέρος,
 Ἄσπραις τρίχαις θέλ' ὁ
 Ἔρως,

Σὰν τοῦ Κύκνου τὰ
 φτερά.

Τὸ λοιπὸν κέγ' ὅσο θέλει
 Ἄς ἀσπρίζω, δὲν μὲ μέλει,
 Παντελῶς δὲ μὲ λυπᾷ.

Ὅτι ὅσο πάντ' ἀσπρίζω,
 Τόσο πλέον νοστιμίζω,
 Τόσ' ὁ Ἔρως μ' ἀγαπᾷ.

Cupid's love for white declaring,
 Snowy locks henceforth com-
 paring

To the plumage he did don.

Wherefore I, how white soever
 I may grow, will grumble never;
 Nor be any way concerned.

All the more of white I 'm
 showing;

All the lovelier I 'm growing;

Thus is Cupid's favour
 earned.

Still more happily Anacreontic is the style of the follow-
 ing piece :

Ἄς γένουμουν καθρέφτης !
 Νὰ βλέπεσαι 'ς ἐμένα,
 Κέγῳ νὰ βλέπω πάντα
 Τὸ κάλλος σου κέσένα.

Ἄς γένουμουν χτενάκι !
 Σιγὰ, σιγὰ νὰ ρχίζω
 Νὰ σχίζω τὰ μαλλιά σου
 Νὰ τὰ συχνοχτενίζω !

Ἄς ἦμουν ἀεράκης !
 Καὶ ὅλος νὰ κινήσω
 Ἐπὶ στήθη σου νὰ πέσω
 Γλυκὰ νὰ τὰ φυσήσω.

Ἄς ἦμουν τέλος ὕπνος !
 Νὰ ἔρχωμαι τὸ βράδυ,
 Νὰ δένω τὰ γλυκὰ σου
 Ματάκια 'ς τὸ σκοτάδι.

O would I were a looking-glass,
 That thou thyself in me
 Beholding, all thy beauty
 I might behold and thee.

O would I were a little comb,
 That softly through thy
 hair
 I might be drawn a hundred
 fold,

And part those tresses rare.

O would I were a gentle breeze,
 All motion and all stealth,
 That I might breathe about
 thy breast

Sweet breath of life and
 health.

Oh, lastly, would that I were
 sleep,

That I might come by
 night,

And bind with chains of dark-
 ness

Those eyes so fair and
 bright.

A worthy companion to this is "The Nightingale :"

Κίν' ἀηδονάκι μου καλό,
Κίνα καὶ πάγε στὸ γιαιλό·
Τὴν ἀκριβὴ ποῦ ξεύρεις,
Νὰ πᾶς νὰ μὲ τὴν εὖρης·

Καὶ σὰν τὴν βρῆς καὶ τὴν
ἰδῆς,
Ἄρχίνα κεῖ νὰ κελαδῆς
Γλυκὰ, γλυκὰ μὲ χάρι,
Νὰ σκύψῃ νὰ σὲ πάρῃ.

Ἄν σ' ἐρωτήσῃ τί 'σ' ἐσύ ;
Καὶ ποιὸς σὲ στέλνει ἀπ' τὸ
νησί ;
Εἰπὲ, πῶς εἶμαι δῶρο
Πουλὶ στεναγμοφόρο !

Πῶς ὁ ἀφέντης μου ἐδῶ
Μὲ στέλνει νὰ σὲ τραγουδῶ·
Τὰ πάθη μου νὰ κλαίγω
Μὲ μέλος νὰ σ' τὰ λέγω.

Ὑστερα σκύψε ταπεινά,
Καὶ λάλησέ την σιγανά,
Καὶ ὀρκισ' την 'ς τὰ
κάλλη
Στὸν κόρφο νὰ σὲ βάλῃ·
Ἄχ ἀηδονάκι μ' δὲν βαστῶ·
Θὰ σὲ τὸ πῶ, Εἶσαι πιστό ;
Ἐπίβουλο μὴ γένῃς
Στὸν κήπον ποῦ ἐμβαί-
νεις.

Fly, nightingale, to yonder
shore,

Fly, fly, what need I tell thee
more ;

Go find me out my dearest,
Go if my prayer thou
hearest.

And when my dearest thou
hast found,

Begin to sing with dulcet
sound,

That she may stoop and
take thee,

And her companion make
thee.

And if of thee she shall demand
Who sent thee from the island
strand,

Say, "Hither come I fly-
ing,

A bird of saddest sighing.

My master sends me for a gift,
That I my voice in song may
lift,

And tell how he doth lan-
guish,

And warble all his an-
guish."

Then like a suppliant appear,
And warble softly in her ear,
And plight thy master's
duty,

Swearing by all her beauty.

Placed in the garden of her
breast—

Ah, nightingale, I cannot rest,
Uneasy fears dismay me,
Lest there thou shouldst
betray me.

Perhaps the rollicking recklessness of Anacreon is nowhere better reproduced than in the following glorification of Bacchus, which in the original, whether for splendid frivolity or rythmic flow, has few equals in any language.

Ὅταν πίνω τὸ κρασάκι
 Στὸ χρυσό μου ποτηράκι
 Καὶ ὁ νοῦς μου ζαλισθῇ.
 Τότ' ἀρχίζω καὶ χορεύω
 Καὶ γελῶ καὶ χωρατεύω,
 Κὴ ζωὴ μ' εὐχαριστεῖ.

Τότε παύουν ἡ φροντίδες,
 Τότε σβύνουν ἡ ἐλπίδες,
 Τότε φεύγουν οἱ καπνοί.
 Κὴ καρδιά μου γαληνίζει,
 Καὶ τὸ στῆθος μου ἀρχίζει
 Νάνασαινή, νάναπνῇ.

Γιὰ τὸν κόσμον δέν μὲ μέλει,
 Ὅς γυρίζῃ ὅπως θέλει,
 Τὸ κρασάκι μου νὰ ζῇ !
 Ἢ κανάτα νὰ μὴ στύψῃ,
 Ἀπ' τὸ πλάγι νὰ μὴ λείψῃ,
 Νάποθάνωμε μαζύ.

When the red wine I am quaff-
 ing,
 In the golden goblet laughing,
 Giddiness o'ercomes my
 brain.
 Then I start a merry pranc-
 ing,
 Leaping, laughing, joking, danc-
 ing;
 Then for me to live is
 gain.

Then my cares no more dis-
 may me,
 Idle hopes no more waylay
 me,
 Then the vapours leave
 my head ;

Then at last my heart is rest-
 ful,
 Then I feel a very breastful
 Of relief within me shed.

Let the world wag on at plea-
 sure,
 It shall ne'er disturb my
 leisure.

Long live bottle, long live
 wine !
 Leave the flagon full beside
 me,
 Then I care not what betide
 me ;
 E'en in death it shall be
 mine.

Ὅσον ἔχω τοῦτον, τοῦτον	This exhaustless wealth pos-
Τὸν ἀκένωτόν μου πλοῦτον,	sessing,
Κόσο πίνω καὶ ρουφῶ·	I am full of every blessing :
Ὅλα σκύβαλα τὰ ἔχω	While I drink and while I
Εἰς κἀνένα δὲν προσέχω	lush.
Καὶ κἀνένα δὲν ψηφῶ.	All the world for dung I reckon,
	Nor regard when any beckon,
	Nor for any care a rush.

But before we take leave of our subject, I think you will be glad to forsake this somewhat artificially heated atmosphere in order to breathe again the unpolluted gales of the Greek people's purer poesy. Through the medium of its language and literature I have tried to introduce you to-night to a land of milk and honey—a land where fancy ranges wild and free, as in the days of yore; a land of speaking rocks and vocal rivers, where every bird can sing with human tones, and every tree may shroud a living soul. Had Schiller lived in such a land as this, he scarce had found occasion to indite his dirge to the perished gods of Greece.

I am now going to conclude this Paper with a ballad embodying in a new shape that universal solar myth, which meets us in all countries and in so many forms. Here the hero and heroine are Anthus, the flower, and Auge, the dawn, who is the sunset likewise. The mother mentioned must be Mother Earth; and the prayer of Anthus that she will wear the funereal chaplet of the dead or sleeping Auge till she arise again, seems to typify the darkness that rests upon the earth from sunset to sunrise. The tears of Mother Earth and her son Anthus are, I take it, the dew drops. Αὐγούλα is diminutive of Αὐγή.

Ὁ ἈΝΘΟΣ ΚΑΙ Ἡ Αὐγή.

Ἡ Αὐγούλα ποῦ ἔφαι ;	Oh ! where is Augula ?
Κοντεύει τὸ βράδυ,	The shadows are closing,
Καὶ μαῦρο σκοτάδι	Black darkness reposing
Πλακώνει τὴ γῆ·	Far and wide o'er the land.

Παγαίνει κεί ποῦναι
 Μακρὸν κυπαρίσσι,
 Παγαίνει στὴ βρύσι·
 Δὲν εἶν' οὐδ' ἐκεῖ.
 Στ' ἀλῶνι στ' ἀμπέλι.
 Στὸ δρόμο κυττάζει,
 Καὶ τέλος φωνάζει·
 " Αὐγοῦλά μ', Αὐγή."
 " Αὐγή μου " συχνότατα
 Τοῦ βγῆκ' ἀπ' τὰ στήθη,
 Κι' " Αὐγή μ' " ἀπεκρίθη
 Μιὰν ἄλλη φωνή.
 Πῶς εἶν' τῆς Αὐγούλας
 Ὁ Ἄνθος ἐστοχάσθη,
 Καὶ πρόθυμ, ἐβιάσθη
 Νὰ πάη νὰ τὴ βρῇ.
 Ἐγύρευ' ἀνήσυχος
 Ὡσὰν περιστέρι,
 Γιὰ νὰ βρῇ τὸ ταῖρι
 Καὶ δὲν τοῦ βολεῖ.
 Καὶ τρέχει καὶ τρέχει
 Κι' ὀλοῦθε κυττάζει,
 Καὶ δίχως νὰ κράζη
 Δὲν μένει στιγμή.
 Τὴν εἶδε προβαίνοντας
 Στὴ μέση κέφωναξ'
 " Αὐγοῦλά μ' ἐτρόμαξ'
 Ὁ Ἄνθος σου πολύ."
 Ἐτοῦτα λαλῶντας
 Κοντὰ τῆς παγαίνει,
 Ἡ Αὐγοῦλα σιωπαίνει
 Καὶ δὲν τοῦ μιλεῖ.
 Προσκέφαλο κόκκινο
 Τῆς κεῖτ' ἀπουκάτου,
 Κρεββάτι θανάτου
 Στενὸ καὶ πικρὺ.
 Θανάτου στεφάνι
 Τριγύρον στὴν κόμη,
 Εἶν' εὐμορφ' ἀκόμη
 Στὴν ὄψι πολύ.

All vainly he seeks her
 Where the tall cyprus waveth,
 Where the rivulet laveth
 The desolate strand.
 By vineyard and wayside,
 And threshing-floor gazing,
 At length his voice raising,
 " Augúla !" amain ;
 " Auge !" times unnumbered,
 From his full heart he crieth,
 And a far voice replieth,
 " Augúla !" again.
 Like the voice of Augúla
 To Anthus it sounded,
 And onward he bounded,
 To find her full fain.
 All restless he sought her,
 As some forlorn dove flies,
 To find where his love lies,
 And seeks her in vain.
 Still onward he hastens,
 His eager eye straining,
 And ever complaining ;
 No respite hath he.
 He descries her before him,
 And loudly entreateth,
 " My heart anxious beateth,
 Augúla, for thee !"
 Thus speaking, he nears her ;
 But as o'er her he bends him,
 No answer she sends him—
 'The dear lips are dumb.
 Oh ! hard narrow death-bed,
 Where lay the cold limbs on
 A cushion of crimson,
 All lifeless and numb.
 A chaplet funereal
 Around her brow presses
 Her beautiful tresses
 Still lovely in death.

Ὁ ἄγγελος ἴσως
 Ποῦ πέρνει τὸ μίλημ'.
 Τῆς πῆρε μὲ φίλημ'
 Γλυκὸ τῇ ψυχῇ.
 Γιατ' ἔχει χαμόγελο
 Ἀκόμῃ στὸ στόμα,
 Ποῦ λές μές στὸ χῶμα
 Δὲν πρέπει νὰ 'μβῇ.
 Δὲν εἶν' 'πεθαμμένη,
 Τὴν ὄψι τηρᾶτε·
 Κοιμᾶται, κοιμᾶται
 Εἰς ὕπνο βαθύ.
 Τῆς πέρνει μὲ χέρι
 Ἀργὸ τὸ στεφάνι,
 Τὸ βγάνει, τὸ βάνει
 Ἀπ' τὴν κεφαλὴ.
 "Ἡ Αὐγούλα κοιμᾶται·
 Ἀλήθεια σου λέγω.
 Μὴν κλαῖς, γιατί κλαίγω,
 Μανούλα, κέσύ.
 Ἴδοῦ τὸ στεφάνι της.
 Μὴν γέρνης στὴν ἄλλη
 Μερὶὰ τὸ κεφάλι,
 Τὰ μάτια μὴν κλῆς.
 Σ' τὰφίνω στὰ γόνατα,
 Καὶ ἀκόμ' ἂν ἀργήσῃ,
 Ἡ Αὐγὴ νὰ ξυπνήσῃ,
 Ἐμὲ τὸ φορεῖς."

Peradventure the angel
 That of speech hath bereft her,
 Kissed the lips ere he left her,
 Sweetly stealing her breath.
 For around the fair mouth still
 A smile seems to hover ;
 Oh ! 't were a pity to cover
 Her thus with the ground.
 Not dead is the maiden,
 Close watch by her keeping,
 Ye shall find she is sleeping
 A slumber profound.
 Now slowly and sadly,
 With hesitant fingers,
 The wreath that yet lingers
 He takes from her brow.
 " 'T is the truth that I tell thee,
 Augula is sleeping,
 For all I am weeping,
 Mother mine, weep not thou.
 See, there is her chaplet,
 Oh ! turn thee not fearfully,
 Close not so tearfully
 Thy sorrowful eyes.
 On thy knees here I leave it,
 Though she slumber, yet bear it ;
 For me thou must wear it
 Till Auge arise !"

ON THE EXPANSION OF THE F LINE OF THE HYDROGEN SPECTRUM.

BY C. H. STEARN AND G. H. LEE.

THE ordinary spectrum of hydrogen consists of four lines; $H\alpha$, coinciding with the Fraunhofer line C in the solar spectrum; $H\beta$, which coincides with F; $H\gamma$, falling near G; and $H\delta$, which coincides with h^* (Plate I., fig. 1). When the discharge from this powerful induction coil and Leyden jar is passed through the tube A (Plate II.), which contains hydrogen at atmospheric pressure, the President will observe that the line F, in the centre of the field of the spectroscope, appears as a broad and nebulous band of light (Plate I., fig. 2). But on closing the stopcock K (Plate II.), which connects the tube with the bag V, and exhausting A by means of the air-pump P, he will see that as the pressure is reduced the line gradually loses its broad and nebulous appearance, and assumes a narrow and well-defined character (Plate I., fig. 1). On opening K, and readmitting fresh hydrogen from V, the line at once returns to its former condition.

The changes in the width of F take place, as you have seen, simultaneously with changes in the density of the gas, and the question we propose to discuss is whether the width of the line gives any indication of the pressure of the

* Besides these lines, there appears under certain conditions another more complicated spectrum of hydrogen, which has been attributed by Angstrom and others to accidental impurities. The authors are, however, convinced, from numerous experiments, that this spectrum really belongs to pure hydrogen, as originally stated by Plucker.

luminous hydrogen which emits it. Mr. Lockyer's views on the subject are thus expressed in *Nature*, Jan. 30, 1873, p. 249:—

“ If we pass a stream of electric sparks through a tube containing hydrogen at the pressure of one atmosphere, we shall see that the colour of the incandescent gas is a bright carmine red, the spectrum of which can easily be observed by placing the spark in front of the slit of one of the spectroscopes before described. If, again, we take a tube that contains hydrogen that has been extremely rarefied, and pass a series of sparks through it, instead of having the brilliant red colour we shall have a pale greenish spark, quite different from the former. *This great difference is due to the difference in the pressures of the hydrogen in the two cases.* The two spectra are equally distinct; the red light shows three splendid lines,—one in the red, another in the bluish-green, and the third in the violet,—while almost the only spectrum that can be obtained in the second case is a single green line, in the same position as the former green line spoken of. There is also this difference which will be observed, that the green line obtained from the tube at atmospheric pressure is very broad and indistinct at the edges, and that the line as seen from the almost vacuous tube is very thin, comparatively speaking, and perfectly sharp and well defined. If we were to take another tube, with a pressure somewhere between the two already mentioned, it would be seen that this green line was not so wide and woolly as in the tube at one atmosphere, and yet not so sharp and well defined as in the almost vacuous tube. *Thus it will be seen that this widening out of the line is due to the difference in pressure.*”

It appears from the above that Mr. Lockyer considers the variation in pressure to be the sole cause of the expansion of this line.

We will now proceed to show that the changes which

were just now seen to accompany the reduced pressure are not necessarily caused by it, but are in a great measure dependent upon the character of the electrical current which is employed to render the hydrogen luminous.

In front of the spectroscope S (Plate II.), we place the tube C, which contains rarefied hydrogen, and near it the tube B, which also contains the same gas at the same pressure. Upon making connection with the battery, the current passes along the wire *x*, through B, along the connecting wire *y*, and then through C, completing the circuit by the wire *z*. The tubes, as you perceive, are both illuminated; and the President, on observing the F line through the spectroscope, will be able to tell you that it is narrow and well defined. Still keeping the same tube before the spectroscope, we remove B and substitute for it another tube, which contains hydrogen at a much higher pressure, and on again rendering the two tubes luminous, it will be seen that the F line appears broad and nebulous in the tube C, which contains the rarefied hydrogen, and which immediately before showed the same line in a narrow condition. Thus the current, by simply traversing another tube placed in the circuit, will acquire the power of rendering the F line broad or narrow in rarefied hydrogen, according to the pressure of the gas in the second tube.

In this exhausted and sealed tube, the pressure in which must remain constant, we will now produce all the changes that were seen in our first experiment, by placing A, which is in connection with the air-pump P, in the position of B, and connecting it in the same manner with C; by alternately exhausting and admitting gas from the bag V, the same changes will now take place in C as if the latter were in process of exhaustion. The cause of the influence exerted by the interposed tube will at once become apparent, when we consider the effect produced by rarefaction upon the

electric conductivity of gases. On disconnecting the wires x and z from the induction coil, and passing the current in the open air between the points R and T, the discharge only takes place, as you perceive, when the poles are within a distance of an inch and a half. But on interposing in the circuit these tubes containing rarefied air, the same discharge passes easily through a distance of fifteen feet, strikingly illustrating the fact that *rarefied gas is a better conductor of electricity than the same gas at a higher pressure*. Let us now consider what effect is produced on the current itself by the interposition of a greater or less resistance in the circuit.

The opposite electricities, + and —, accumulate on the outer and inner coatings of the Leyden jar J, and discharge between them takes place as soon as the charge acquired by the jar is sufficiently powerful to overcome the resistance to discharge offered by the air between the poles R and T. If the poles be near together, the resistance being small, the charge of the jar is slight, and the report given by discharge is also faint. As we gradually separate the poles, and thereby increase the resistance, the report becomes louder and louder, and now appears almost deafening to those in the immediate vicinity.

The relative amount of the charge communicated to the jar when the current passes through an inch and a half of dense air, and through the fifteen feet of rarefied air, can easily be made apparent. Having attached the wires connected with these tubes to the poles R and T, the poles are approximated while the current passes, and as it will travel by the course of least resistance, we shall get no discharge between the points until they are very near; so soon as we get a discharge between them, we may conclude that the resistance offered by the short distance in air is about equal to the fifteen feet of vacuum; and how weak this charge is

you may infer from the very feeble report which it gives to the ear.

When, therefore, we interpose the tube B, containing rarefied gas, the line F is not expanded in C, because the Leyden jar receives no appreciable charge; but when another tube containing dense gas is substituted, the line is expanded by the augmented charge which is communicated to the jar.

Not only can the F line be shown wide in an exhausted tube, but it can also be obtained as narrow as in a vacuum tube with the gas at atmospheric pressure. It has been recently shown by Dr. Salet,* that by bringing the poles almost in contact in a current of hydrogen at atmospheric pressure, and removing the jar, this effect may be produced,—a result which we have confirmed by experiment.†

As, therefore, the line F has been on the one hand rendered wide in an exhausted tube, and on the other reduced to a narrow line at atmospheric pressure, it follows that no inference as to the relative pressure of the hydrogen could be drawn from its appearance.

As the pressure of gases increases with elevation of temperature, it might be thought that the pressure of the gas was considerably increased in the tube by the heat developed by the passage of the spark. To test this, a syphon gauge was attached to one of the tubes, and the level of the mercury observed when the line was respectively narrow and broad; but no alteration in the height of the column was perceptible. It was observed by Secchi, that though the line is expanded in the narrow central part of

* *Annales de Chimie et de Physique*, Jan., 1873.

† The above experiments were performed by us in November, 1872, and read before the Royal Society in May, 1873; it was not till afterwards that our attention was directed by Dr. Huggins to Dr. Salet's Paper, which was published in January, 1873, in which by a different method the author had arrived at a similar conclusion.

the tube, it appears at the same time narrow in the wider parts at the ends; and as the temperature is considerably higher in the former, the expansion was attributed by him to elevation of temperature. The same conclusion was also drawn by Salet from the variations in width obtained by him at atmospheric pressure.

On repeating the above experiment of Secchi's, we found that in WIDE tubes no increase in the charge of the jar would expand the line in rarefied gas, because, the medium being rendered highly conducting, the energy of the charge became diffused laterally over the whole mass, and the intensity on each portion was thus lessened; but when the tube was narrow, the expansion took place in consequence of the concentration of the charge. If the gas be dense, the width of the tube is unimportant, as there is then no tendency to lateral diffusion of the electric energy.

Let us next consider the bearing of these facts on solar phenomena.

Surrounding the sun, and extending to a height of many thousand miles from its surface, is an atmosphere of luminous hydrogen, named by Mr. Lockyer the chromosphere. This envelope is of variable thickness, and is subject to violent disturbances, causing frequent outbursts of incandescent hydrogen in the form of prominences or eruptions. Some of these solar eruptions, observed by us,—which frequently rise to a height of sixty thousand to a hundred thousand miles,—are represented in Plate III.

Now, when the slit of the spectroscope is placed radially on the sun's limb, so as to include a vertical section of the chromosphere, the appearance of the F line is as represented in Plate I., fig. 3,—wide at the base and narrow at the summit. Mr. Lockyer thus applies the reasoning above quoted to the explanation of this phenomenon.*

PLATE III.

SOLAR PROMINENCES VIEWED BY MR. G. H. LEE, MARCH, 1878.

THE SAME PROMINENCES AT INTERVALS OF 15 MINUTES.

VARIOUS PROMINENCES.

“You will bear in mind what I told you about the effect of pressure in altering the spectrum of hydrogen, and that one of the most obvious effects of increased pressure was to increase the thickness of what is called the F line,—the line now under consideration; you will see here that the widening of the F line, the green line of hydrogen, really indicates a thickening due to pressure. In that way we have been able to determine approximately the pressure of these circumsolar regions. When the pressure of the chromosphere is completely determined, we shall be probably enabled to determine the temperature of the sun.”

It appeared to us, as the tapering form of F in the chromosphere is only seen when a vertical section of the solar atmosphere is viewed through the slit, that a comparison between it and the hydrogen in our tubes should be made, by observing a transverse section of the spark. We therefore placed a wide tube with electrodes at the ends, containing hydrogen at one or two inches pressure, at right angles to the slit of the spectroscope. The centre of the spark would then correspond to the lower edge of the chromosphere and the outer portions to its higher regions. The appearance presented was, as we anticipated, similar to that seen in the chromosphere; the hydrogen lines appearing as lozenges of light, wide in the central portion of the spark, and tapering as they receded from it. Plate I., fig. 4.

It has been recently argued that the pressure is increased in the track of the spark, but that owing to the slight conduction of heat by the gas this pressure does not extend to the surrounding portions. We therefore filled a narrow tube, about thirty-five inches long, the upper electrode being fused into the end, and the lower placed three or four inches below it. The lower open end having been immersed in mercury, it was exhausted by the Sprengel to about a quarter to half an inch pressure, the mercury being then almost in

contact with the lower electrode. The current when passing rendered the *whole* tube luminous.

On carefully observing the line F with a direct-vision spectroscope, it appeared with the simple current fine throughout the tube; and on interposing the Leyden jar and increasing the charge, as in the former experiments, it expanded equally in *every part, from the upper electrode to the level of the mercury*; but not the slightest change in the height of the barometric column was visible.

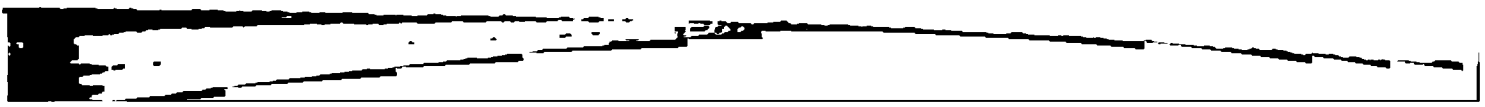
Since then, on the one hand, this line may be observed to be fine, while the hydrogen is at atmospheric pressure, on the other, may be of considerable width in a highly rarefied medium, and also with the gas apparently at constant pressure, the width of the line may greatly vary, how would it be possible to determine in any way the pressure on the solar surface by the width of F?

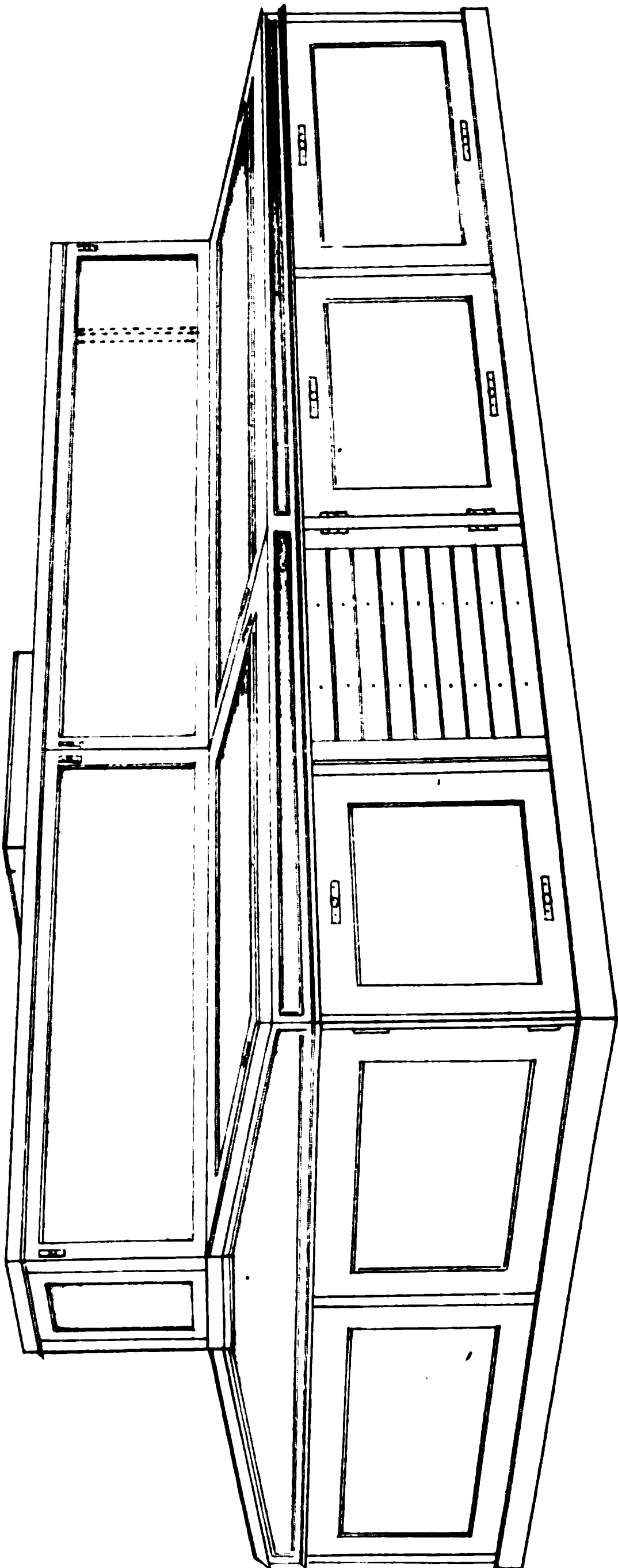
In all that has been written on the subject of the expansion of lines, only two circumstances seem to have been considered, viz., temperature and pressure; and it is assumed that to one or other of these causes the expansion must be due. But if this expansion be due to a disturbance of the normal period of vibration of the molecules, is it not probable that it may be produced directly by the electric current at a high tension, without much elevation of temperature.

The above experiments seem to indicate that these perturbations may take place without any perceptible alteration of pressure; and the question still remains for solution, whether, the pressure remaining nearly constant, the expansion must necessarily be caused by an increase of temperature? It seems to be generally *assumed* that the temperature of the Leyden jar discharge is much higher than that of the uncondensed spark; but is there any experimental proof of this assumption? The spark of the former is undoubtedly

more luminous, but its heating power is known to be much less than that of the latter. When the jar is placed in circuit, the whole table is illuminated with light; yet this piece of paper, held in the midst of the glowing gas, is not ignited, but only punctured; when the jar is removed, but little light is visible, while the paper or even a splinter of wood is instantly inflamed. The explanation which has been given, that this effect is due to the extremely short duration of the Leyden jar discharge, appears unsatisfactory, for though each discharge lasts but a brief period, yet the succession of discharges is so rapid as to be apparently continuous, and, if the luminosity be the result of high temperature, should heat the air sufficiently to fire the paper. If the air is not heated, the light cannot be the result of high temperature. May it not be that in the slow, prolonged discharge of the simple current, the electrical energy is chiefly transformed into the long waves of heat, while the greater portion of the more rapid current produced by the jar is converted into the shorter waves, which affect our sensation as light?







SYNOPSIS
OF AN ARRANGEMENT OF
INVERTEBRATE ANIMALS

IN THE
FREE PUBLIC MUSEUM OF LIVERPOOL;

WITH
INTRODUCTION;

BY THE
REV. HENRY H. HIGGINS, M.A., CAMBRIDGE,
FOR THE LAST FIFTEEN YEARS A MEMBER OF THE COMMITTEE OF THE
TOWN COUNCIL FOR THE MANAGEMENT OF THE LIVERPOOL FREE
PUBLIC LIBRARY, MUSEUM, AND GALLERY OF ART.

READ BEFORE THE LITERARY AND PHILOSOPHICAL SOCIETY
OF LIVERPOOL, OCTOBER, 1873.

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1874.



INTRODUCTION.

IN October, 1861, when the Natural History Collections presented to the Town of Liverpool by the Grandfather of the present Earl of Derby were removed from Duke Street to the building which they now occupy, the question arose, how should the Museum be made as fully as possible to answer the requirements of the population by whom it was to be supported, under the provisions of the Library and Museum Act.

The Curator, Mr. Moore, whose valuable services are well known and highly appreciated, having on his hands, besides the duties of general superintendence, the re-arrangement of the extensive series of Mammalia and Birds, together with preparations for the reception of a similar series of Fishes and Reptiles, availed himself of my offer of assistance in obtaining and arranging a collection of Invertebrate Animals, our stock of which at that time included little beyond some corals and a few very miscellaneous specimens.

The accommodation available for the proposed collection consisted of the central areas of a suite of five rooms, 27 feet in breadth, the total length being 250 feet. Space was thus provided for 20 table cases, each 10 feet long, set transversely.

One important point was therefore settled by the shape of the building. The series had to be conformed to a linear arrangement. In some respects this was a serious disadvan-

NOTE.—The substance of the greater part of this Introduction appeared in *Nature*, Jan. 12 and April 20, 1871.

tage. The classes of invertebrate animals cannot well be represented in a single ascending or descending series. Probably it would not be possible on any *symmetrical* plan to assign to them their proper positions relatively to each other: but some palpable incongruities might be avoided by the use of table-cases on a ground-plan resembling a genealogical tree, one proposed form of which is represented by a diagram in a work published by Professor Rolleston. (See opposite page.)

The importance of a suitable ground-plan for cases in museums seems to be much under-rated. When a class of students visit a museum frequently, the localities of cases containing special groups become indelibly impressed upon the memory. This might be turned to good account.

In preparing the first scheme of the collection, it seemed essential that plain and moderately simple printed descriptions of the life history of the animals should accompany the specimens: therefore, as it was clearly impossible to describe every genus, it became necessary to fix on some mode of associating in groups a number of examples to which the descriptions might apply. Such divisions as "classes" and "orders" were manifestly too large; whilst "families" varied from a single genus, including a solitary species, to an army of more than a thousand genera,—*e. g.*, the Linnæan families *Cerambycidae* and *Curculionidae* in the Coleoptera. It was with some regret that the idea of attaching a readable sketch to each division of a given rank in recent systems of classification was relinquished, but it was found to be impracticable; and the life history sketch thus became the foundation of the arrangement eventually adopted.

Whether it might be a few species, or a genus, or a family, or an order, that seemed to afford suitable scope for a page of readable and instructive matter, it was decided

TABULAR VIEW OF ALL THE CLASSES IN THE ANIMAL KINGDOM, from "*Forms of Animal Life*," by Professor Rolleston, F.R.S. It will be seen on inspection that, with the exception of the elevation of the Classes in VERMES for the sake of keeping the great ANNULOSE division together, the plan of the Synopsis very nearly coincides with that of the following Table.

Mammalia.

Aves. VERTEBRATA.

Reptilia.

Amphibia.

Pisces.

Insecta.

Arachnida. Myriapoda.

ARTHROPODA.

Crustacea.

Holothuroidea.

Echinoidea.

ECHINODERMATA.

Asteroides.

Crinoidea.

Cephalopoda.

Pteropoda.

Gasteropoda.

MOLLUSCA.

Lamellibranchiata.

Tunicata.

Brachiopoda.

Polyzoa.

Annulata. Gephyrea.

VERMES.

Rotifera.

Nematelminthia.

Platyelminthia

Ctenophora.

COELENTERATA.

Anthozoa.

Hydrozoa.

Spongiadæ. Infusoria.

PROTOZOA.

Rhizopoda.

Gregarinæ.

that, throughout the entire Collection, such a group should be segregated, so as to form the unit of the series. Eventually, in order that the sketches, which it was proposed to print for that purpose on tablets, might all be in positions where they could conveniently be read, it was found to be expedient that each group or unit should occupy an equal space; and as the blocks on which the table cases rested were to be fitted up with trays or drawers, twelve of which would occupy the table case without loss of room, these trays or drawers were adopted as the receptacles and boundaries of the groups.

The drawers measured 27 inches in length by 16 inches in breadth, and their number in the 20 table cases when completed would be 240. Then arose the problem how best to divide the 28 Classes of Invertebrate Animals into 240 groups, each of which should be capable of affording materials for a biological notice, such as might be read with interest by any intelligent visitor.

The entire plan of the table cases, and the limits of many of the groups, were committed to writing before any considerable advance had been made in procuring specimens. In one respect this circumstance was found to be very advantageous—our *desiderata* were at once well defined. It was an object that each of the groups should be illustrated by carefully selected specimens; and until this could be attained, other acquisitions need not be sought for. In making purchases such an object, steadily kept in view, exercises a powerful influence against the seductive attractions of “great bargains,” which often turn out to be great misfortunes to a museum. Moreover, in accepting donations it is sometimes convenient to be able to refer to a fixed plan. Where room is scanty, as in most museums, nothing is more subversive of order, or more fatal to an instructive arrangement, than the

gift of a collection, coupled with a stipulation that it must be displayed in some special way. It is far better to forego the possession even of a valuable series of specimens, than to sacrifice order for their sake.

The number of groups, 240, will no doubt appear to have been determined simply as a matter of convenience. To a certain extent this is true. It is also true that after a careful reference to the best accessible authorities on each of the Invertebrate Classes, in which much assistance was afforded me by the many valuable scientific works in the Free Public Library of Liverpool, it seemed probable that most of the prominent forms in all the classes might be exhibited in pairs, with their names and localities attached in large and legible characters, in an area less than 1,000 square feet; and that they might conveniently be disposed in 240 groups, occupying 20 table-cases. For these the suite of rooms above referred to afforded ample accommodation.

Four table-cases contain the PROTOZOA and the CœLENTERATA. Seven are given to the MOLLUSCOIDA and MOLLUSCA. Two are occupied by the sub-kingdom ANNULOIDA, including ECHINODERMATA and SCOLECIDA. Three are given to ANNELIDA and CRUSTACEA. Four cases hold the MYRIAPODA, ARACHNIDA, and INSECTA. For constant exhibition to the public the series as thus constituted may be regarded as quite sufficiently extensive.

It is hardly necessary for me to point out the difficulties and disadvantages which must arise in the course of an attempt to form a collection in which the whole of the invertebrate classes are divided into a given number of equal groups. If all very distinct forms are to be exhibited, some groups must be heterogeneous in composition, but not necessarily very many. Such forms as *Pycnogonum*, *Forficula*, and *Sagitta* may have to appear as associated with other not

very closely allied forms ; but the printed tablet may explain the circumstances under which they occupy their position, and render the disadvantage simply a negative one, namely, that in such instances the arrangement cannot afford much help to the memory. It is, on the other hand, one of the peculiar advantages of the plan that the tray or drawer containing an entire group can, with the utmost facility, be removed to be re-arranged, to illustrate a lecture, or to occupy a different position in the series.

<p style="text-align: center;">EXAMPLES</p> <p style="text-align: center;">OF</p> <p style="text-align: center;">EXOTIC SPECIES.</p>		
<p style="text-align: center;">Earliest fossils of the Group.</p>	<p style="text-align: center;">Printed tablet of Life History</p>	<p style="text-align: center;">British Species.</p>

Plan of a Group on a scale of 1/4th lin.

In the present unsatisfactory condition of systematic Zoology, probably the only thoroughly scientific mode of conveying information respecting an assemblage of organic forms

is that adopted by Professor HUXLEY, Professor ROLLESTON, and others, of describing completely a single included species; but this method seems more suited for students than for a mixed company, such as have visited our Institution since October, 1861, during which period the admissions to the Liverpool Museum have exceeded 5,000,000.

The following is the plan of arrangement adopted, in connexion with each group. Wherever circumstances permit, the plan for each group includes, (1) A printed schedule. (2) Exotic species. (3) British representatives. (4) The printed tablet. (5) Earliest fossils. (6) Diagrams and other illustrations. (7) Species and varieties on a more extended scale.

(1) The schedule, of which an example follows, is printed in large type, and is attached, conspicuously, to the drawer.

Group 222.

SUB-KINGDOM	—	<i>Annulosa</i> ,	Skeleton external, ringed.
PROVINCE	—	<i>Arthropoda</i> ,	Limbs jointed.
CLASS	—	<i>Insecta</i> ,	Legs six.
SUB-CLASS	—	<i>Metabola</i> ,	Transformations complete.
ORDER	—	<i>Lepidoptera</i> ,	Wings with scales.
SUB-ORDER	—	<i>Rhopalocera</i> ,	Horns clubbed at the apex.
FAMILY	—	<i>Papilionidæ</i>	Middle nerve of fore-wing four-branched.

The next sub-division appears, not on the schedule but on the printed tablet, as the distinctive title of the 222nd group. The following is a copy of the tablet pertaining to the 222nd group.

“ Genus ORNITHOPTERA and allies.

Bird-winged Butterflies.

Estimated number of species, 20.

“ The species of *Ornithoptera*, unrivalled in size and unsur-

passed in magnificence of outline, deservedly stand at the head of the Butterflies.

“ They are natives of New Guinea and the neighbouring islands, where, as it is said, the tropical birds are jealous of their beauty, and injure them by pecking at their wings.

“ The inhabitants of Darnley Island capture specimens of *O. Poseidon*, and, securing them by one end of a long thread, they fasten the other end to their hair, allowing the butterflies to flutter round their heads.

“ Observe the contrast between the highly-finished colouring in the Humming-bird Butterflies, *Erycinidæ*, and the bold massive style in which the gold is laid on in the forewings of the appropriately named *O. Cræsus*.

“ The genus *Leptocircus*, judged by form and colour, seems to be out of place in this group; but other characters, considered to be of great importance in the classification of the Lepidoptera, such as the venation of the wings and the structure of the legs, indicate its proper place to be in the family *Papilionidæ*.

“ The only species of the genus *Teinopalpus* (observe the long and porrect palpi) inhabits the highest ranges of the Himalayas, especially towards the frontiers of Assam.”

Thus far we have noticed the schedule and the tablet.

3rd. *Foreign species*. The further portion of each drawer, to the extent of three-fifths (more or less) of the whole area accommodates from 10 to 60 exotic species, singly or in pairs, such species as are most distinct being preferred. A reference to the authority accompanies, as a rule, the generic, sub-generic, and specific names. The locality, when copied from a monograph, is stated simply; but when it is known where the specimen has been collected, the word “from” is added, *e. g.*, “*Ornithoptera Cræsus*, from the Island of Batchian.”

4th. *British species.* The nearer right-hand corner of each drawer is occupied by representatives of the group indigenous to Britain. Some groups have no British representatives; in others, *e.g.*, *Noctuæ genuinæ*, a selection from the British species fills three-fourths of the drawer. Amongst these, foreign specimens of rarities are admitted; but in all such cases the words "exotic specimen" are appended to the name on the label.

5th. *Earliest fossils.* The nearer left-hand corner in each drawer is assigned to a few fossils, showing the earliest appearance of the group in the geological series. In some instances, *e. g.*, *Hippurites*, *Rugosa*, and the *Trilobites*, the entire group is represented only by fossils; in others, fossils are absent.

6th. *The printed tablet.* Between these two latter sections of each drawer is placed the printed tablet, about the size of an octavo page. It exhibits an attempt to describe some of the salient points in the life-history of the group. Here, and throughout the series, some attention has been given to ensure legibility by the use of moderately large type, names and descriptions being of much less value when they cannot be read *easily*.

7th. *Diagrams and other illustrations.* The upright portion of the table-case over each drawer is given to miscellaneous illustrations of the group. The series includes drawings, plates, and photographs of structure and anatomy, economic products, silk in various stages, marine and fresh-water pearls, cameos, from the rough medallion cut from the shell to the finished work, polished shells, and sections showing the interior of shells, eggs and egg-cases, preserved larvæ and pupæ, preparations in spirits, examples of mimicry, nests of *Hymenoptera*, galls and their tenants; timber and stone pierced by molluscs, crustacea, and insects; malformations

and distorted growths, healed fractures, coral beads, British and exotic specimens of fungi growing on pupæ, and many other objects of interest.

8th. *Species and varieties.* The blocks on which some of the table cases rest are fitted with drawers suitable for receiving an extended series of species and varieties, valuable only to the student, and intended to be seen only on application to the Curator. Very little progress has hitherto been made in carrying out this portion of the plan, which has, however, the good effect of rendering it quite needless to overcrowd the groups with less significant species.

The difficulties attending the formation of the series have not been very great. Collections have been presented to the Museum by several friends of natural science, amongst whom may be mentioned Mr. SAMUEL SMITH, of Liverpool, the donor of a collection of shells rich in generic forms and in costly varieties of the highest beauty. Mr. MOORE has been successful in establishing friendly communications with many captains of merchant vessels sailing from the port of Liverpool, some of whom have been supplied by the Committee of the Museum with dredges and collecting apparatus, and have become enthusiastic naturalists. In recognition of their services, several of them have been received as Associate Members of the Literary and Philosophical Society of Liverpool, a distinction which seems to be highly appreciated by them. Something has also been done in the way of exchanges; but a large proportion of the whole series has been selected and purchased specimen by specimen. No object has been purchased simply on account of its rarity; but at the same time no reasonable expense has been spared in procuring the most beautiful and perfect examples.

A few general remarks on the subject of expense may be permitted; details will gladly be communicated to enquirers

connected with museums. It is notorious that few collections exhibited to the public will bear comparison with corresponding series contained in private cabinets. Why should this be any longer permitted? It may arise *in part* from the impression that in public museums it is unnecessary to spend much on specimens. Public collections depending chiefly on donations are however likely to be overstocked in some departments, whilst entirely deficient in others. There can be no excuse for extravagance, but a rigid economy may be pushed too far. The trouble and great risk of collecting in tropical climates must often be very inadequately represented by the apparently high prices asked for the chief *desiderata*, and the rest of a collector's stock may remain on his hands for years.

Again, if a genus or a group is illustrated in nature by a great number of distinct and beautiful forms, *e. g.*, such genera as *Madrepora*, *Conus*, *Cetonia*, &c., this surely is of itself a biological fact which may claim, even on scientific grounds, to be fairly and appropriately represented in a collection. Even on the most severe estimate of what is necessary for an educational series, something must be allowed simply for the sake of beauty and attractiveness; that is to say, if museums are to avoid the fate of certain parochial lending libraries which contain only such books as, it is said, everybody *ought* to like to read.

Why moreover should the public be encouraged to esteem art treasures as so much more valuable than the choicest productions of nature? One hears of a pair of vases being sold for two thousand pounds, a sum which would provide twenty first-rate table cases, and stock them with very fair illustrations of the whole of the invertebrate groups. It is a happy circumstance that a museum of common objects may at a trifling cost be established in almost any village, and, with

judicious local influence brought to bear upon it, may prove both useful and creditable; but why should not wealthy communities, possessing endless drawing-rooms ablaze with costly decorations, exercise something of a corresponding liberality towards the museum of natural history, which is the representative of their appreciation of that which is higher than the highest art?

Considerable difficulty has been found in selecting appropriate materials for the printed tablets. Many of the chief continental authorities on invertebrate animals, admirable as are their works for the purpose of identifying species, afford scarcely a line of information on the life history of the objects they so grandly figure, and often so elaborately describe. Even the reports of scientific expeditions may frequently be searched in vain for this kind of information, which has to be gleaned from authorities not always trustworthy, from scattered papers, or from a few books of travel such as those which have been issued in this country on the Malay Archipelago and the River Amazon, and more recently on Nicaragua.

It is mortifying to have to exhibit forms distinguished by extraordinary developments of structure, and to be able to say nothing on associated habits. Such strange developments were once considered to be mere freaks of nature, but no one now doubts their having a biological and even a genealogical significance. What a field is here opened! How little of the biology of a new form has been exhausted when it has been collected, named, described, figured, and even dissected. Scientific treatises have prepared the foundation for a solid knowledge of the subject; but there would be occasion for regret if biology should ever come to be regarded by students in an aspect too exclusively morphological, histological, or even physiological, if such a view operated to the disparagement of genuine out-of-door observations. The greatest

advance in Natural History made in the present, or perhaps in any generation, has been mainly accomplished by two observers, who are pre-eminently life-historians and out-of-door naturalists.

Little need be said of the miscellaneous illustrations contained in the upright portions of the table cases. They seem to be very successful in engaging the attention of visitors of all classes—a point which is felt to be of prominent importance where the admissions amount, taking the average of open days throughout the year, to about 2,000 daily. What brings them here? is a question which again and again suggests itself. Reduce the number by all the idlers and mere sight-seers who, no doubt, constitute a large proportion of the gathering; still, if only 100 or even 50 per day seek some kind of instruction, even these in the course of a year form a large and teachable class. As a firm believer in the humanising effect of an intelligent interest in Natural Science, to myself the grand museum problem seems to be, how to make such an institution most beneficial to the greatest number.

In estimating the value to the public of a Museum of Natural History, the speciality of its function should not be overlooked. It occupies a position quite peculiar to itself, and does, or claims to do, what in its absence must be left undone. Many may desire to look upon the wondrous forms which constitute the population of the sea, the lake, the river, the forest, or the grassy plain, but it is only in very rare instances that such far off dwelling places can be explored by those whose lot is cast in the busy centres of social life. The Museum is the best, if not the only, resource.

It is not thus in the departments of Natural Philosophy and Art. Chemistry, Mechanics, and other allied branches of knowledge, lead so directly to practical advantages, that in almost every large town opportunities of many kinds and

in various quarters are afforded for the study of such obviously useful sciences. Art, including music, has its representative centres in thousands of homes; and, omitting other and more select illustrations, I will venture to affirm that the cultivation of a taste for much that is refined and beautiful in art has very effective aid in the collections displayed to meet the eyes of all who pass through the streets of a populous town. It is probable that such exhibitions are not made with purely educational intentions; but as commerce is the great promulgator of civilisation, howbeit not always undertaken for that purpose, so trade, in its free display of choice fabrics, mechanism, jewelry, ceramic wares, engravings, and *sometimes* even pictures, is a benefactor to the public taste.

I own myself indebted for many pleasant hours to the shop-windows, pleasant, but not exempt from the recurrence of the question, Are there not other examples of embroidered tissues, of exquisite machinery, of purely combined colours, and graceful configurations, unseen by the throng, and yet as suitable as these to gratify the beholders? And it has been consolatory to remember that there was, not far away, one place at least where some care had been taken to invite attention to the wares of Nature's own handiwork.

I am disposed to set a high value on the delight afforded simply by the beauty of natural objects. A specimen without a history, or even without a name, that calls forth a genuine exclamation, How beautiful! fulfils a noble mission; especially when the observer is a child, or young.

But the aim of a museum is to do something more than this. No mere assemblage of rare and beautiful objects can impart more than a small portion of the gratification capable of being conveyed by a store of natural productions. It is the exhibition of the order and affinity between one form and another, and between successive groups of forms, that constitutes the chief function of a museum.

In reporting the progress of a work which has found employment for me more or less constantly during a period of twelve or thirteen years, it is a gratifying duty to acknowledge the assistance afforded me from many quarters. An impulse highly favourable to the success of the plan was given at the outset, by the provision of a series of Table Cases such as I have not seen surpassed elsewhere. This has been seconded by the purchase from time to time of many valuable works on biology, chiefly Continental, and such as are rarely to be found in provincial libraries, though almost indispensable for the study of special classes of the Invertebrata. Liberal consideration has moreover always been given to the acquisition, by purchase or otherwise, of specimens necessary for the Collection. Acknowledgments are also due to the Chairman and Members of the Museum Committee, not only for the honour of a place at their board, but also for the sympathy and support which have rendered the meetings of the Committee occasions to myself of much gratification.

To Mr. MOORE, the Curator of the Museum, I am indebted for many valuable suggestions, especially for the very important recommendation through which the series has been made an ascending instead of a descending one. The *Echinodermata* chiefly, and the *Crustacea* almost entirely, were obtained for the Museum through Mr. MOORE. Nearly the whole of *Echinoidea* were named by Professor ALEXANDER AGASSIZ, on one of his visits to the Museum; and it was only in the course of naming and arranging the rest of the *Echinodermata* and the *Crustacea* that the care and discrimination shown by Mr. MOORE in the selection of the specimens became fully known to me. One very valuable class of acquisitions, those collected and presented by Masters of merchant vessels, may justly be in a great measure attributed to the interest and good will enlisted in favour of the Museum by the unfailing courtesy of the Curator.

In completing the eighty-four groups assigned to the *Mollusca*, I have been much indebted to the assistance of Mr. FREDERICK PRICE MARRAT, a long known and highly esteemed friend, whose intimate and very extensive acquaintance with shells, as also with the perplexing synonyms of conchology, has rendered his services of the highest value. The identification and manipulation of the specimens, within the groups, in the *Mollusca*, and also in the *Cœlenterata*, has for some time past been almost entirely entrusted to him. In the manipulation of the *Crustacea* and *Echinodermata*, I have been fortunate in having the efficient aid of Mr. JOHN CHARD, whose coloured drawings appear with excellent effect in most of the twenty Table Cases.

The following Synopsis is designed to shew the systematic position and limits of each group. The arrangement in the higher divisions, sub-kingdoms, provinces, and classes, is almost entirely in accordance with the classification adopted by Professor HUXLEY, and published in *The Student's Manual of Geology*, by J. BEETE JUKES, M. A., F. R. S., 1872. The derivations of many scientific names have been given in Greek characters, to avoid the ambiguity inseparable from the use of English letters to express Greek words.

The Tablets in each group, as a rule, do not refer to the particular specimens exhibited; but in the Synopsis some objects of more than ordinary interest are often specified. Visitors inspecting the Collection have frequently expressed themselves gratified by having their attention called to illustrations which might otherwise have escaped their notice. To most of the groups have therefore been appended short notes, designed to render the Synopsis in this respect useful as a handbook to the Collection.

FRONTISPIECE. To admit as much light, and to obstruct the view of the specimens as little as possible, the upper wooden frames of the table cases are reduced to the narrowest limits consistent with firmness and security. In the upright compartment the top, bottom, and ends, as well as the sides, are of plate glass, and if a shelf is required it is made of the same material. To give readier access to the specimens, both sides of the upper compartment fall. To exclude the dust, piano-forte hinges are used; each frame closes on double strips of velvet; zinc gutters underlie every crevice; and in addition to the locks, bolt-screws are used, which by a half-turn bind the frames closely down in every part.

As text-books for students of Zoology, the following works may confidently be recommended: *A Manual of Zoology*, by HENRY ALLEYNE NICHOLSON, M.D.; and *Introduction to the Study of Biology*, by the same AUTHOR. Published by W. Blackwood and Sons.

**TABLE OF THE ARRANGEMENT ILLUSTRATED
IN THE FOLLOWING SYNOPSIS.**

Sub-kingdom PROTOZOA.

**Classes MONERA, GREGARINIDA, RHIZOPODA,
SPONGIDA, INFUSORIA.**

Sub-kingdom CŒLEENTERATA.

Classes HYDROZOA, ACTINOZOA.

Sub-kingdom MOLLUSCA.

**Classes POLYZOA, TUNICATA, BRACHIOPODA,
LAMELLIBRANCHIATA, PTEROPODA,
GASTEROPODA, CEPHALOPODA.**

Sub-kingdom ANNULOIDA.

Classes ECHINODERMATA, SCOLECIDA.

Sub-kingdom ANNULOSA.

**Classes ANNELIDA, CRUSTACEA, MYRIAPODA,
ARACHNIDA, INSECTA.**

SYNOPSIS

OF AN ARRANGEMENT OF

INVERTEBRATE ANIMALS.

First Table Case.

The Mark ¶ indicates specimens or other illustrations exhibited in the Cases.

Sub-kingdom PROTOZOA.

πρῶτος, first ; ζῷον, animal.—Lowest forms of animal life.

Group 1.—Class MONERA (HAECKEL). *μόνος, only ; ῥέω, I flow.* Living gelatinous matter extending over vast areas of the ocean bed at great depths.

¶ Drawing of *Bathybius haeckelii*, HUXLEY, enclosing coccoliths.

Class GREGARINIDA (LEON DUFOUR), *gregarius*, occurring in numbers together. Found chiefly in the intestines of insects and worms.

¶ Drawings illustrating reproductive phenomena in *Gregarinæ*. Section exhibiting *Eozoon*.

Many minute aquatic organisms of very simple structure, but of active habits, are here left unnoticed, as belonging probably to the Vegetable Kingdom, or as of uncertain development.

Class RHIZOPODA (DUJARDIN). *ρίζα*, root; *ποὺς*, foot.—Limbs formed by simple extensions of the soft body.

Order FORAMINIFERA. *Foramen*, an orifice; *fero*, I carry. Animalcules forming calcareous, rarely arenaceous, shells, found in sponges, sand, etc. The *Foraminifera* are exclusively marine, and have a world-wide distribution.

Group 2.—FORAMINIFERA-IMPERFORATA and allies.

¶ Models, by D'Orbigny and Fric', of about forty-six species. *Cycloclypeus*, specimen $1\frac{3}{4}$ inches in diameter, collected and presented by Dr. Collingwood.

Upper Compartment.

Drawings of *Amœba* and *Actinophrys sol.*

Group 3.—FORAMINIFERA-PERFORATA.

¶ Models, by D'Orbigny and Fric', of about seventy-six species, including *Globigerina* and other *Rhizopoda*, from the deep seas.

Group 4.—Order RADIOLARIA. *Radius*, a ray. Marine animalcules, constructing exquisitely formed glassy shells.

¶ Photographic plates of *Polycistina*, from Barbadoes.

Class SPONGIDA. σπόγγος, a Sponge.

Till very recently this class has been much neglected. A fine old work by Esper, 4 vols., 4to, contains many plates of Sponges; but these have been superseded by the investigations of Haeckel, Schmidt, Gray, Bowerbank, Carter, and Saville Kent. The groups exhibit a small portion only of the entire collection, which Mr. T. Higgin, of Huyton, has kindly undertaken to name and arrange for the use of students.

Group 5.—Orders MYXOSPONGIÆ and CALCISPONGIÆ (HÆCKEL). Calcareous Sponges, and Sponges possessing no fibrous endo-skeleton. Estimated number of species in class Spongida: British, 200. BOWERBANK, 1864–66.

Order FIBROSPONGIÆ (HÆCKEL).

Group 6.—Family HEXACTINELLIDÆ (SCHMIDT), Part I. ἑξ, six; ἄκτιν, a ray. Spicules silicious, with rectangular rays.

Genus HYALONEMA. ὑαλος, crystal; νῆμα, thread.

¶ *Hyalonema Sieboldii*, the glass-rope Sponge—several specimens, exhibiting the body of the sponge attached to the stem encrusted by the commensal zoophyte, *Palythoa*.

Genus EUPLECTELLA. εὖ, well; πλεκτος, twined.

Euplectella aspergillum. Sponge from the Island of Cebu, Philippines, where it is known by the name of “Regadera.” It has also been called Venus’s Flower-basket.

Meyerina claviformis (GRAY). A very rare and beautiful sponge, from the same locality with the preceding; length 26 inches, greatest diameter 3½ inches. The body of the sponge is seen enclosed in a sheath resembling the finest lace-work. Imported and presented by Capt. Snook, ship *T. E. Lemon*.

Group 7.—Family HEXACTINELLIDÆ (SCHMIDT). Part II.

¶ *Pheronema Grayi* (KENT).

Collected off the coast of Portugal, and presented by W. SAVILLE KENT.

Holtenia Carpenteri (WYVILLE THOMSON).

Globular Anchor-Sponge, collected during the expedition of H. M. S. "*Porcupine*," and presented by Prof. WYVILLE THOMSON. Specimens of allied fossils, *Ventriculites* and *Choanites*, from the chalk formation.

Group 8.—Remainder of Order FIBROSPONGIÆ (HAECKEL).

¶ Series of British Marine Sponges; specimens of fresh-water sponge, *Spongilla*, collected at Rainhill, and presented by Charles Longuet Higgins.

Upper Compartment.

Specimens exhibiting many of the remarkable varieties of form assumed by the Fibrous Sponges.

Group 9.—Class INFUSORIA = STOMATODE PROTO-ZOA.

The class thus restricted includes a small section only of the INFUSORIA of the older authors.

¶ Coloured Drawings of *Stentor*, *Vorticella*, *Noctiluca*, &c., chiefly from Ehrenburg, *Die Infusionsthierchen als Vollkommene Organismen*. Leipzig, 1854–6.

Sub-kingdom COELENTERATA.

(FREY & LEUCKART.)

κοῖλος, *hollow*; ἔντερον, *the bowel*.—Food-canal open to the body-cavity.

Class HYDROZOA (HUXLEY). Internal cavity simple.

A monograph of the Hydrozoa is much needed. Ellis and Solander, Ato, and Lamouroux, Histoire des Polypiers Flexibles, describe comparatively few of the species now known to science. Recent works on the subject, such as "Contributions to the Natural History of the United States, by L. AGASSIZ," are chiefly confined to local productions.

Sub-class HYDROIDA; animals resembling the Hydra.

Group 10.—Order HYDRIDA-GYMNOCHROA (HINCKS).

γυμνός, *naked*; χροά, *the skin*. Estimated number of species: British, 4.

¶ Drawings of several species of *Hydra*, and of the modes of its reproduction by buds and ova.

Group 11.—Order HYDRIDA-THECAPHORA (HINCKS).

θηκη, *a sheath*; φέρω, *I carry*. Sertularian and Campanularian Zoophytes. Estimated number of species: British, 92. HINCKS.

¶ Series of British Zoophytes, collected and presented by H. H. H. Small series of Exotic Zoophytes. Examples of GRAPTOLITES.

Upper Compartment.

Drawings of ovarian vesicles of *Sertularia*.

Group 12.—Order HYDRIDA-ATHECATA (HINCKS). α

without; θηκη, *a sheath*. Tubularian Zoophytes. Estimated number of species: British, 70.

¶ Specimens of the horny tubes of *Tubularia*, and of *Eudendrium*.

Upper Compartment.

Drawings of medusiform gonophores, &c., illustrating reproductive phenomena in *Coryne*.

Second Table Case.

The mark ¶ indicates illustrations exhibited in the cases. The coloured drawings are by JOHN CHARD, Liv. Pub. Mus.

Group 13.—Sub-class SIPHONOPHORA. σίφων, a tube; φέρω, I carry. OCEANIC HYDROZOA.

¶ Specimens and Drawings of *Porpita*, *Velella*, and of *Physalia*, the “Portuguese Man-of-War.”

Upper Compartment.

Preparations in liquid of the animals of various HYDROZOA.

Group 14.—Sub-class DISCOPHORA. δίσκος, a disc; φέρω, I carry. NAKED-EYED, or TRUE MEDUSÆ.

¶ Coloured drawings of these very beautiful, but small and little-known, Jelly-fish.

Group 15.—Sub-class LUCERNARIDA. *Lucerna*, a lamp. HIDDEN-EYED MEDUSÆ.

¶ Drawings of the HYDRA-TUBA, and its development: and of various ACALEPHÆ, including the common Jelly-fish of our shores, which are in fact the free-swimming flowers, *gonophores*, of the little stationary Hydra-tuba.

Group 16.—Sub-class MILLEPORIDA. The animals are propagated by free-swimming Medusiform Gonophores.

¶ Specimens of the Coralla of various Millepores from the West Indies, where they are familiarly known as “Sea-ginger.”

Upper Compartment.

Drawings of the animal of Millepora.

Class ACTINOZOA. *ακτιν*, a ray; *ζῷον*, an animal. Internal cavity compound.

The groups in this class are named and arranged chiefly after Milne Edwards' Histoire Naturelle des Coralliaires; but most valuable aid has been received from the magnificent work by James Dana, on the Zoophytes of the United States Exploring Expedition, 1838-1842.

Group 17.—Order RUGOSA. *rugosus*, wrinkled.

The members of this order are, with rare exceptions, only known as Palæozoic fossils. The rays are in multiples of four.

¶ Polished sections, chiefly from Devonian rocks.
The Order Rugosa includes 224 species.

Order ZOANTHARIA. *ζῷον*, an animal; *ἄνθος*, a flower. Parts in multiples of 5 or 6.

Sub-order SCLERODERMATA. *σκληρος*, hard; *δέρμα*, the skin. Corallum secreted within the animal.

Division TABULATA. Corallite divided by horizontal plates : rays not developed.

Group 18. — Genera SERIATOPORA (LAMARCK), and POCILLOPORA (BLAINVILLE). The former from *series*, a row; the latter from *pocillum*, a little cup. Estimated number of species : recent, 28; British, 0; fossil, 14; Palæozoic.

¶ Corals from the Pacific and Indian Oceans, including a very beautiful *Seriatopora* possibly undescribed : other examples from the Red Sea, &c.

Group 19.—Family FAVOSITIDÆ. *Favus*, a honeycomb. Estimated number of species, 102; all Palæozoic fossils.

¶ The Chained-Coral and other species from the Wenlock Limestone, &c.

Division PERFORATA. Rays well developed: coral porous.

Group 20.—Family PORITIDÆ. Reef-building corals, usually massive. Estimated number of species: recent, 83; British, 0; fossil, 36.

¶ Examples of *Psammocora*, *Montipora*, *Alveopora*, and other genera.

Group 21.—Sub-family TURBINARINÆ (MILNE EDWARDS).
Turbo, a top.

Genus TURBINARIA (OKEN) = GEMMIPORA (BLAINVILLE). Estimated number of species: recent, 11; British, 0; fossil, 7.

¶ Large foliaceous and cup-shaped Corals from the East Indies and the Fiji Islands. Dome-shaped specimen of *Astræopora*, remarkable for its highly finished calices.

Group 22.—Genus MADREPORA (LINNÆUS). Part I.
The name is from the Italian, signifying Mother-pore, the apical polype being the parent of the rest on the same branchlet. Natives of tropical seas: one species is known from the White Sea.

Upper Compartment.

Larger Corals, including *M. palmata*, an explanate Madrepore, sometimes attaining a height and breadth of seven feet.

Group 23.—Genus MADREPORA (LINNÆUS). Part II.
Estimated number of species in genus *Madrepora*: recent, 84; British, 0; fossil, 6; Kainozoic.

¶ *M. echinata*, *M. carduus*, *M. longicyathus*, and other slenderly branched Madrepores, are amongst the most beautiful of all the coral tribe.

Group 24.—Genus DENDROPHYLLIA (BLAINVILLE) and allies. δένδρον, a tree; φύλλιον, a leaf. Estimated number of species: recent, 28; British, 0; fossil, 81; Kainozoic.

The Corals of this group grow in waters of all temperatures.

¶ *D. nigrescens* from Singapore, and *D. ramea* from the Mediterranean: the latter attains a height of five feet, and possesses an agreeable fragrance.

Third Table Case.

The Mark ¶ indicates specimens or other illustrations exhibited in the Cases.

Division APOROSA. Coral compact in substance.

Family FUNGIDÆ. Coralla chiefly explanate; polype centres not circumscribed.

Group 25.—Genus AGARICIA (LAMARCK) and allies. ἄγαρικός, a mushroom. Estimated number of species: recent, 17; British, 0; fossil, 13; chiefly Kainozoic.

¶ Species from the West Indies and the Pacific.

A. undata grows on the vertical sides of rocks, like a large flower with the corolla fully expanded, and beautifully ripple-marked.

Group 26.—Genus LOPHOSERIS (MILNE EDWARDS) and allies. λόφος, a crest; σέρις, a plant. Lamarck's name for this genus, *Pavonia*, alludes to the expanded disc of the coral, with polype-mouths in place of the eye-spots of the Peacock's tail. Estimated number of species: recent, 24; British, 0; fossil, 42.

¶ Examples from the Indian and Pacific Oceans.

Upper Compartment.

L. prætorta, curiously intricate in its growth.

Group 27. — Genus FUNGIA (LAMARCK) and allies.
 Estimated number of species : recent, 32 ; British, 0 ;
 fossil, 9 ; chiefly Mesozoic.

¶ Specimens of *Fungia*, shewing the attachment of
 the young corals to the under-side of the
 parent coral, which is itself free and un-
 attached.

Specimens of *Herpetolitha*, the Slug-coral ; and of
Polyphyllia, the Mole-coral.

Upper Compartment.

Genus *Halomitra* Dana ; the corallum is deeply
 cup-shaped, and shews, within, the truncated
 frustum of a former corallum on which the
 present specimen seems to have been developed.
 The same peculiarity has been observed by the
 writer in other specimens of *Halomitra*.

Group 28.—Genus MERULINA (EHRENBERG). *μηρύω*, to
 wind, in allusion to the corded appearance of the sur-
 face. The coralla take the form of leaves spread out
 one above the other. Estimated number of species :
 recent, 7 ; British, 0 ; fossil, 0.

¶ Specimens from the Sooloo Sea and the Fiji
 Islands.

Group 29.—Genus ECHINOPORA (LAMARCK). *Echinus*,
 the Hedge-hog. This and the preceding group exhibit
 forms of transition between the Fungidæ and the
 Astræidæ. Estimated number of species : recent, 8 ;
 British, 0 ; fossil, 1.

¶ Specimens from the Indian Ocean and the Red Sea.

Family ASTRÆIDÆ. ἄστρον, a star.

Group 30.—Division ASTRÆACEÆ (MILNE EDWARDS) and allies. The species of this group are amongst the most important of reef-building corals. Estimated number of species: recent, 122; British, 0; fossil, 267. Mesozoic and Kainozoic.

¶ *Heliastrea*, *Acanthastrea*, *Astræa*, *Prionastrea*, *Isastrea*, *Culicia*, &c.

Group 31.—Section LITHOPHYLLIACEÆ MEANDRO-
IDÆ (MILNE EDWARDS). Estimated number of species: recent, 69; British, 0; fossil, 84; chiefly Kainozoic.

¶ Brain Corals. The polype-cells form long sinuous channels like the windings of a stream, or the convolutions of the brain; hence the familiar name.

In the Lettuce Coral, the cell-walls are as thin as paper, the polypes large and beautifully coloured.

Upper Compartment.

Meandrina mammosa, called by sailors Neptune's Shield; and other large corals.

Group 32.—Sections LITHOPHYLLIACEÆ CESPITOSÆ et SIMPLICES (MILNE EDWARDS). Estimated number of species: recent, 30; British, 0; fossil, 154. From the Trias upwards. In genus *Mussa* (OKEN), as in *Astræa* and *Meandrina*, the corals grow in hemispheres attaining ten or twelve feet in diameter, adorning the ocean bed with richly coloured cupolas.

¶ Examples of nearly all the recent genera.

Group 7.—Family HEXACTINELLIDÆ (SCHMIDT). Part II.

¶ *Pheronema Grayi* (KENT).

Collected off the coast of Portugal, and presented by W. SAVILLE KENT.

Holtenia Carpenteri (WYVILLE THOMSON).

Globular Anchor-Sponge, collected during the expedition of H. M. S. "*Porcupine*," and presented by Prof. WYVILLE THOMSON. Specimens of allied fossils, *Ventriculites* and *Choanites*, from the chalk formation.

Group 8.—Remainder of Order FIBROSPONGIÆ (HAECKEL).

¶ Series of British Marine Sponges; specimens of fresh-water sponge, *Spongilla*, collected at Rainhill, and presented by Charles Longuet Higgins.

Upper Compartment.

Specimens exhibiting many of the remarkable varieties of form assumed by the Fibrous Sponges.

Group 9.—Class INFUSORIA = STOMATODE PROTOZOA.

The class thus restricted includes a small section only of the INFUSORIA of the older authors.

¶ Coloured Drawings of *Stentor*, *Vorticella*, *Noctiluca*, &c., chiefly from Ehrenburg, *Die Infusionsthierchen als Vollkommene Organismen*. Leipzig, 1854–6.

Fourth Table Case.

The Mark ¶ indicates specimens or other illustrations exhibited in the Cases.

Group 37.—Sub-order ZOANTHARIA—SCLEROBASICA.

σκληρὸς, hard; βασίς, a pedestal = ANTIPATHARIA (MILNE EDWARDS). αντιπαθής, of opposite properties. The horny axis of the coral is thickly beset with short spines, and is covered by the common tissue uniting the polypes. Estimated number of species: recent, 24; British 0; fossil, 1.

¶ Specimens of *Antipathes* and *Cirrhipathes*, the former shrub-like and delicately branched; the latter with a simple stem growing in a loose coil. The species are widely distributed, growing on rocks in deep water.

Upper Compartment.

Antipathes arborea, the black coral of commerce; rough, and manufactured into beads.

Group 38.—Sub-order ZOANTHARIA - MALACODERMATA.

μαλακός, soft; δέρμα, the skin = ACTINARIA (MILNE EDWARDS). ἄκτιν, a ray. Distinguished by the absence of a solid corallum. Estimated number of species: recent, 200; British ; fossil, 0.

¶ Models in coloured glass of about 80 species of British Sea Anemonies.

Order ALCYONARIA. ἄλκυων, the Halcyon of the ancients.

In this order the polypes have eight fringed tentacles.

Group 39.—Family PENNATULIDÆ. Penna, a feather.

The quill of the Sea-Pen during the life of the animal remains plunged into the mud at the bottom of the sea, but does not contract any adherence. Estimated number of species: recent, 26; British, 8; fossil, 1.

¶ Examples of *Pennatula*, *Virgularia*, *Pavonaria*, *Renilla*, &c.

Upper Compartment.

Quill of a gigantic Sea-Pen, from British Columbia.

Family GORGONIDÆ. γοργών, the Gorgon of the ancients.

Group 40.—Genus CORALLIUM (LAMARCK). κόρη, maiden daughter; ἅλος, of the sea. Estimated number of species: recent, 8; British, 0; fossil, 2; Kainozoic.

¶ Specimens of *Corallium rubrum*, the Red Coral of the Mediterranean; one very large, with more than 40 tines.

Group 41.—Sub-family ISIDINÆ (MILNE EDWARDS). Ἴσις, the goddess Isis. Estimated number of species: recent, 13; British, 0; fossil, 4; Kainozoic.

¶ *Mopsea*, with slenderly forked branches; *Isis*, (decorticated) with black and white articulations, and *Melitea* with various shades of scarlet and bright yellow: all have joints or rendering them more or less flexible.

Group 42.—Sections GORGONELLACÆ and BRIARACÆ (MILNE EDWARDS).

Section is here used as equivalent to 'Agèle' (MILNE EDWARDS).

Estimated number of species: recent, 15; British, 0; fossil, 0. The axis of the stem is either sub-calcareous, or made up of spiculæ.

¶ Examples of *Verucella* and *Juncella*, and a very beautiful specimen of *Paragorgia Johnsoni* from Madeira, presented by its discoverer, J. YATE JOHNSON.

Group 43.—Section GORGONACÆ. Part I. Foliaceous.

Estimated number of species: recent, 25; British, 2.

¶ *Phyllogorgia*, in which the polype crust is expanded, forming wings on each side of the stem. *Rhipidigorgia*, or Sea-Fans, in which the branches repeatedly unite, forming a network.

Group 44.—Section GORGONACEÆ. Part II. Arborescent.

Estimated number of species: recent, 58; British, 2. The base of the *Gorgonia* polype secretes the tough horny elastic stem: another portion of the same polype secretes the soft crust, or bark, which owes its beautiful colour to the presence of calcareous spiculæ.

¶ Examples of most of the genera; but the larger fruticose forms occupy the upper compartment.

Group 45.—Section PRIMNOACEÆ. *πρύμνα*, the poop of a ship. On the coast of Norway *Primnoa* is said to attain the height of fifty or sixty feet. Estimated number of species: recent, 13; British, 1.

¶ *Primnoa verticillata* from Madeira, presented by J. S. TYERMAN. *Primnoa lepadifera* is a desideratum.

Family ALCYONIDÆ. No solid central axis.

Group 46.—Sub-family TUBIPORINÆ (MILNE EDWARDS).

Estimated number of species: recent, 7; British, 0; fossil,

¶ Specimens of *Tubipora musica*, the Organ-pipe coral, and of other species of the genus, from the Indian and Pacific Oceans and the Red Sea.

Group 47.—Sub-family ALCYONINÆ (MILNE EDWARDS)

and allies. Estimated number of species: recent, 50; British, 3; Fossil, 0.

¶ Examples of *Spoggodia*, and other genera. Coloured drawings of *Alcyonium digitatum*, with the polypes expanded, and of other species, chiefly after Dana.

Group 48.—Order CTENOPHORA. *κτεῖς*, a comb; *φερο*, I carry. Transparent oceanic *Actinozoa*, resembling in habit some of the smaller Jelly-fish, but much more highly organized. Swimming by means of cilia arranged in vertical comb-like rows.

¶ Coloured drawings of *Pleurobrachia* = *Cydippe*, *Cestum*, *Idya*, &c., chiefly after BLAINVILLE, LESSON, and L. AGASSIZ.

Fifth Table Case.

The Mark ¶ indicates illustrations exhibited in the cases. The coloured drawings are by JOHN CHARD, *Liv. Pub. Mus.*

Sub-kingdom MOLLUSCA.

mollis, soft.

Province MOLLUSCOIDA. Ab-normal MOLLUSCA.

Class POLYZOA. *πολὺς*, many; *ζῶον*, an animal. Estimated number of species: recent, 860, (Busk, 1854); British, 112, (Johnston, 1847); fossil, 1,600; from the Silurian upwards.

A monograph of the class POLYZOA, combining the fossil with the recent species, after the admirable method of MILNE EDWARDS in his Histoire Naturelle des Coralliaires, may be regarded as an achievement worthy of the ambition of any Naturalist. Taking into consideration the exquisite beauty of the species, their wide distribution in time and space, their convenient size, and the interesting questions connected with their structure and habits, no other unoccupied Biological field seems to present equal attraction.

The three groups here assigned to this class are based upon characters by no means satisfactory, but it has been found convenient to retain them. The more scientific distinctions are illustrated by coloured drawings in the upper compartment.

Group 49.—Genus RETEPORA (LAMARCK); *rete*, a net; and allies. Polyzoarium chiefly calcareous and rigid.

¶ Examples of *Tubulipora*, *Cellepora*, *Idmonea*, *Hornera*, &c., including some very beautiful Retepores and other Polyzoa from the Atlantic Cable. *Oldhamia* from the Cambrian rocks, possibly a plant.

Group 50.—Genus FLUSTRA (LINNÆUS). Saxon *Flustrian*, to weave; and allies. Polyzoarium chiefly horny, foliaceous or explanate.

¶ Examples of *Lepralia*, *Carbasea*, *Membranipora*, *Electra*, &c. Observe how closely *Amathia spiralis* (LAMOUROUX), from Australia resembles in form *Archimedipora Archimedeæ* (LESUER); a fossil from the Carboniferous Limestone, Kentucky. A delicate cup-shaped *Flustra* on *Catenicella*.

Group 51.—Genus CATENICELLA (BLAINVILLE); *catena*, a chain; and allies. Polyzoarium chiefly articulated and flexible.

¶ Examples of *Cellularia*, *Salicornaria*, *Bicellaria*, *Emma*, *Bugula*, &c.

Upper Compartment.

Diagram of a Polyzoon, and of an “avicularium,” or Bird’s-head process. Coloured drawings of fresh-water Polyzoa, after ALLMAN.

The animals of the POLYZOA are always minute, and live associated in colonies. They are much in advance of the CŒLENTERATA in complexity of structure; the food canal being entirely shut off from the body-cavity, and the nervous system being well defined.

Group 52.—Class TUNICATA. *Tunica*, a cloak. The Ascidians, or Tunicaries, are marine animals, having their internal organs protected by a double integument, tough and elastic, in place of a shell. Estimated number of species: recent, 150; British, 73.

¶ Coloured drawings of solitary, social, and compound Ascidians.

Upper Compartment.

Preparations in spirits of Salpians in the chained and solitary states; also of *Pyrosoma*, and many other Ascidians. Diagrams of the early development of an Ascidian, shewing by the presence of a pseudo-notochord its approach to the form of the vertebrate embryo.

Group 53.—Class BRACHIOPODA. *βράχιον*, the arm; *πὺς*, a foot. The Lamp-shells possess a true upper and under valve. Estimated number of species: recent, 100; British, 5; fossil, 1,000, from the Silurian upwards.

¶ Examples of nearly all the recent, and of a few of the fossil genera.

Upper Compartment.

Animals of *Lingula*, and other Brachiopoda in spirits.

Group 54.—Order RUDISTES (LAMARCK). Estimated number of species: recent, none known at present; fossil, 100, from the Chalk and Hippurite Limestone.

¶ Examples of *Hippurites*; Specimens of *Radiolites*, *Caprinella*, *Caprina*, and *Caprotina*, are desiderata.

Province MOLLUSCA.

MOLLUSCA PROPER.

The series of MOLLUSCA was commenced by a small but very useful collection, presented in 1859 by the late Miss YATES, of Liverpool. Some of the desiderata were supplied at the same time by H. H. H.; others from time to time have been acquired by purchase, especially at the sale of the Dennison Collection, in 1863. A very fine collection of choice Shells was in 1868 presented to the Museum, by SAMUEL SMITH, Esq., Banker, of Liverpool.

The Recent Species have been named and arranged in accordance with "The Genera of Recent Mollusca," by HENRY and ARTHUR ADAMS: from the same prolific source has been derived much of the information recorded in the tablets. The excellent "Manual of the Mollusca," by the late S. P. WOODWARD, and the "Manuel de Conchyliologie," by M. CHENU, have been followed in arranging the fossil illustrations. Of the 1890 Generic and Sub-Generic forms recognised in the "Genera of Recent Mollusca," the collection at present contains illustrations of about 1121. The "History of British Mollusca and their Shells," by EDWARD FORBES and S. HANLEY, has been used in naming and arranging the British representatives in the 78 groups assigned to the Mollusca Proper.

Class LAMELLIBRANCHIATA. *lamina*, a plate; *βράγχια*, the gills of fish. = CONCHIFERA (LAMARCK). Bivalve Mollusca.

Section ASIPHONIDA. *α*, without; *σιφών*, a tube.

The absence of a respiratory siphon indicates, generally, that the species do not live immersed in sand or mud.

Group 55.—Family OSTRÆIDÆ and allies. *Oyster*. Estimated number of species: recent, 182; British, 5; fossil, 200. Carboniferous, &c.

¶ Examples of *Ostrea*, *Anomia*, *Plicatula*, *Spondylus*, *Placunanomia*.

Upper Compartment.

Placenta orbicularis, used for windows in some parts of China; Group of *Pedum* in coral of the genus *Porites*.

Group 56.—Family PECTENIDÆ and allies. *pecten*, a comb. Estimated number of species: recent, 220; British, 13; fossil, 600. Carboniferous, &c.

¶ Examples of *Pecten*, *Lima*, *Radula*, *Hinnites*.

P. Proteus, exhibiting contrasts of colour between specimens of the same species. *Lima excavata*, North Sea. R. M'ANDREW.

Group 57.—Family ARCIDÆ and allies. *arca*, a chest. Estimated number of species: recent, 341; British, 11; fossil, 600. Lower Silurian, &c. *Trigonia*, justly admired for the beauty of its pearly interior, and now found only in Australian Seas, is represented by many species in the Mesozoic rocks of Britain.

¶ Examples of *Arca*, *Trigonia*, *Nucula*, *Yoldia*, *Leda*, *Cucullæa*, *Pectunculus*, *Adrana*.

Group 58.—Family AVICULIDÆ and allies. diminutive of *avis*, a bird. Estimated number of species: recent, 100; British, 2; fossil, 450. Silurian, &c.

¶ Examples of *Pinna*, *Meleagrina*, *Avicula*, *Perna*, *Crenatula*.

Upper Compartment.

Large group of *Vulsella* in sponge.

Group 59.—Family MYTILIDÆ and allies. *Mussels*. Estimated number of species: recent, 250; British, 12; fossil, 220. Silurian, &c.

¶ Examples of *Ætheria*, *Mulleria*, *Mytilus*, *Crenella*, *Myrina*.

Upper Compartment.

Lithophaga in stone.

Group 60.—Family UNIONIDÆ. *unio*, a pearl. River-mussels. Estimated number of species: recent, 574; British, 4; fossil, 100. Tertiary.

¶ Examples of *Unio*, *Anodonta*, *Mycetopus*.

Upper Compartment.

British Pearls; figures of Bhudda and artificial pearls in *Unio plicatus*.

Unio multiplicatus; extensive fracture repaired in a very peculiar manner by the animal; from the GASKOIN cabinet.

Sixth Table Case.

The Mark ¶ indicates specimens or other illustrations exhibited in the cases.

Section SIPHONIDA. σιφων, a tube.

The presence of a well developed respiratory siphon indicates, generally, that the species live more or less immersed in sand or mud.

Group 61.—Family LUCINIDÆ and allies. *Lucina* a name of Juno. Estimated number of species: recent, 362; British, 17; fossil, 330. From the Devonian upwards.

¶ Illustrations of the genera in the families *Un-
gulinidæ*, *Laseidæ*, *Leptonidæ*, *Galeommidæ*,
Solemyidæ, *Astartidæ*. Fine series of *Crassa-
tella*.

Group 62.—Family CHAMIDÆ and allies. χαμαι, on the ground. Estimated number of species: recent, 52; British, 0; fossil, 30. From the Chalk upwards.

¶ *Chama*, *Hippopus*, *Tridacna*, *Arcinella*, *Chame-
trachæa*, &c. *Chama Lazarus*, very fine.

Upper Compartment.

Small example of *T. gigas*, the largest known mol-
lusc; the shell attains the weight of 500 lbs.

Group 63.—Family CARDIIDÆ and allies. *καρδία*, the heart. Cockles. Estimated number of species: recent, 162; British, 9; fossil, 300. From the Silurian upwards.

¶ *Cardium*, *Hemicardia*, *Bucardia*, &c.

Adacna and *Monodachna* are generic forms from the Caspian.

Group 64.—Family CYRENIDÆ and allies. Cyrene, the daughter of a river. The olive-green epidermis indicates a fresh-water habit. Estimated number of species: recent, 255; British, 12; fossil, 195. Tertiary.

¶ Illustrations of the genera in the families *Glaucconomyidæ*, *Cyrenidæ*, *Cyrenoididæ*.

Family VENERIDÆ.

Group 65.—Genus TAPES (MEGERLE) and allies. *tapes*, tapestry. Estimated number of species: recent, 257; British, 8; fossil, 60. Tertiary.

¶ *Dosinia* = *Artemis*, *Tapes*, *Circe*, *Clementia*, *Rupellaria*, &c. *Sunetta*, fine series of species.

Group 66.—Genus VENUS and allies. Estimated number of species: recent, 238; British, 6; fossil, 160; from the Oolite upwards.

¶ *Venus*, *Callista*, *Chione*, &c.

Chione Kellettii, from the DENNISON collection.

Family TELLINIDÆ.

Group 67.—Sub-family DONACINÆ, and allies. Wedge-shells. Estimated number of species: recent, 227; British, 10; fossil, 60. Tertiary.

¶ *Donax*, *Mesodesma*, *Semele*, *Ervilia*, &c.

Note.—The beautiful interior of *Galatea*, from African rivers.

Group 68.—Sub-family TELLININÆ. τέλλη. (PLINY.)

The Tellens, though inferior to the Pectens in striking contrasts of colour, are, in refinement of beauty, at the head of all the bivalve shells. Estimated number of species: recent, 409; British, 20; fossil, 184. Oolite, &c.

¶ *Tellina*, *Lucinopsis*, *Metis*, *Tellidora*, &c.

T. lata, and others of great beauty.

Group 69.—Family MACTRIDÆ, μάκτρα, a kneading-trough.

Estimated number of species: recent, 188; British, 8; fossil, 40, chiefly Tertiary.

¶ *Macra*, *Lutraria*, *Harvella*, *Raëta*, *Labiosa*, &c.

Upper Compartment.

Interior of *Lutraria*, coloured to shew the pallial sinus. Genus *Anatinella* is a desideratum.

Group 70.—Family ANATINIDÆ, and allies. *anatinus*,

pertaining to the duck. Estimated number of species: recent, 190; British, 17; fossil, 850. Devonian, &c.

¶ *Thracia*, *Myochama*, *Corbula*, *Periploma*, *Pandora*, &c. *Pholadomya*, extremely rare, and a desideratum in a recent state, is a magnificent genus of 150 species as seen in its fossil representatives from the Lias, &c.

Group 71.—Family SOLENIDÆ and allies. σωλήν, a

gutter-tile. Razor-shells. Estimated number of species: recent, 24; British, 5; fossil, 60. Eocene, &c.

¶ *Mya*, *Panopæa*, *Novaculina*, &c. *Saxicava Angasi*.

Group 72.—Family PHOLADIDÆ and others. φωλεία,

living in holes. Estimated number of species: recent, 181; British, 14; fossil, 60. Eocene, &c.

¶ *Clavagella*, *Brechites* = *Aspergillum*, *Pholadidea*, *Parapholas*. The true bivalve shell of *Asper-*

gillum, not larger than a Laburnum seed, may be seen on the tube.

Upper Compartment.

The tube of *Kuphus giganteus*. Specimens of wood perforated by *Teredo*, often called the Shipworm, shewing the destructive character of the borings made by this animal.

Seventh Table Case.

The Mark ¶ indicates specimens or other illustrations exhibited in the Cases.

Group 73.—Class PTEROPODA. πτερόν, a wing; πούς, a foot. Pelagic Mollusca, of small size, often found swimming in countless myriads on the surface of the deep, especially on calm evenings, from the tropics to high latitudes. The shells are delicate and glassy. The animals are very simply organised, and resemble the minute but actively locomotive larvæ of the sea-snails. Estimated number of species: recent, 73; British seas, 5; fossil, several species of *Conularia*, and other genera, from the Silurian upwards.

¶ Examples of about 40 species of *Balantium*, *Cavolina*, *Hyalæa*, *Clio*, *Limacina*, and other genera.

Series containing more than a few species of *Pteropoda* are rare in collections. For the comparatively numerous examples here exhibited, the collection is indebted chiefly to Captains of merchant vessels sailing from Liverpool, especially to Captains WHITEWAY, MORTIMER and BAKER.

Class GASTEROPODA.

γαστήρ, the stomach ; ποὺς, the foot.

Head distinct, furnished with eyes and tentacles. Body usually protected by a conical or spiral shell. Lower part of the body formed into a thickened, expanded, creeping disc or foot. This class includes all the land and most of the fresh-water and marine univalve *Molluscs*. The latter when very young have ciliated wings on the sides of the head, by which they swim freely about ; the body being contained in a minute spiral shell, having an operculum.—H. & A. ADAMS.

Sub-class BRANCHIO-GASTEROPODA,
βράγχια, gills. Organs of respiration constructed to breathe air suspended in water.

Group 74.—Order HETEROPODA. ἕτερος, diverse ; ποὺς, the foot.

This and the succeeding order are retained at the commencement of the GASTEROPODA because, although they may be regarded as more highly organized than the PROSOBRANCHIATA, they are less characteristic members of the Branchiate Gasteropods.

Estimated number of species : recent, 70 ; British, 3.

¶ Examples of Oceanic Shells—*Janthina*, *Atlanta*, &c., including *Carinaria vitrea*.

Upper Compartment.

Coloured drawings of *Firola*, &c. Preparations in liquid of Heteropodous animals ; *Janthina* with its raft, from which the eggs of the animal are suspended.

Order OPISTHOBRANCHIATA. ὀπισθε, behind; βράγχια, gills. Organs of respiration situated towards the rear of the body.

Group 75. — Sub-order NUDIBRANCHIATA. *nudus*, naked. The Sea-slugs, though destitute of shells, are often highly and beautifully coloured. Estimated number of species: recent, 300; British, 26. They are referred to two sections.

SECTION I.—AILOBRANCHIATA. αἰολος, changeable. Gills in parallel rows.

¶ Coloured models of Nudibranchs from the Mersey; *Tritonia*, *Eolis*, &c.

SECTION II.—ANTHOBRANCHIATA. ἄνθος, a flower. Gills in the form of a flower.

¶ Coloured models of Nudibranchs, *Doris*, &c.

Upper Compartment.

Coloured drawings and specimens in spirits.

Group 76. — Sub-order TECTIBRANCHIATA. *tectus*, covered. Gills protected by a shell, or by the mantle. Estimated number of species: recent, 338; British, 23; fossil, 100. Trias, &c.

The animals frequent weedy shores and coral reefs: their bodies often exhibit lively colours, and are frequently much larger than the shells which protect the respiratory organs.

¶ Examples of most of the genera in the families. *Actæonidæ* = *Tornatellidæ*, *Aplustridæ*, *Cyllichnidæ*, *Bullidæ*, *Philinidæ*, *Lophocercidæ*, *Aplysiidæ*, *Pleurobranchidæ*.

Order PROSOBRANCHIATA. *πρῶσον*, in front ; *βράγχια*, gills. A very extensive order, comprising most of the univalve Sea-shells best known in collections.

Sub-order SCUTIBRANCHIATA. *scutum*, a shield. Animals chiefly littoral in their habits, living on rocks or sea-weeds near the shore.

Section EDRIOPHTHALMA. *ἔδρα*, a seat ; *ὀφθαλμος*, the eye. Eyes sessile. Shell, in the adult, conical, not spiral.

Group 77.—Family CHITONIDÆ. *χιτών*, a coat of mail. Estimated number of species : recent, 255 ; British, 11 ; fossil, 80, from the Devonian upwards.

¶ Examples of *Lophyrus*, *Tonicia*, *Lorica*, *Cryptoplax* = *Chitonellus*, *Mopalia*, &c.

Upper Compartment.

Plates of the shell of *Leptochiton*, separated to illustrate the homology of the last plate with the entire shell of *Patella*.

Group 78.—Family PATELLIDÆ and allies. *patella*, a dish ; Limpets. Estimated number of species : recent, 142 ; British, 7 ; fossil, 100 ; from the Silurian upwards.

¶ Examples of *Tectura*, *Scutellina*, *Gadinia*, *Nacella*, &c.

Group 79.—Families FISSURELLIDÆ & DENTALIDÆ. Duck's-bill Limpets, Key-hole Limpets, Tooth-shells. Estimated number of species : recent, 141 ; British, 7 ; fossil, 144. Devonian, &c.

The *Dentalia* have been regarded as *Pteropods* ; also as *Fissurellæ*, with highly conical and attenuated shells.

¶ Examples of *Antalis*, *Scutus* = *Parmophorus*, *Emarginula*, *Cemoria*, *Lucapina*, *Tugali*, *Cranopsis*, *Macrochisma*, &c.

Section PODOPHTHALMA. πούς, foot; ὀφθαλμος, eye.
Eyes on foot-stalks.

Group 80.—Family HALIOTIDÆ ἅλιος, marine. οὖς, ear.
Estimated number of species: recent, 74; British, 1;
fossil, 4. Miocene.

Upper Compartment.

¶ Series of polished *Haliotis*, including the principal kinds used in the manufacture of papier-maché articles, card cases, &c.

Family TROCHIDÆ.

Group 81.—Sub-Family ASTRALINÆ and allies. αστρον, a star. Estimated number of species: recent, 200; British, 8; fossil, 5. Miocene.

¶ Examples of *Stomatella*, *Gena*, *Stella*, *Rotella*, *Guilfordia*, *Broderipia*, *Trochiscus*, *Camitia*, *Microtis*, *Scissurella*, &c., constituting an assemblage of very beautiful generic forms.

Group 82.—Sub-Family TROCHINÆ. trochus, a hoop. Estimated number of species: recent, 556; British, 16; fossil, 300. Silurian, &c.

The shells of the *Trochinae* are found on the coasts of all seas, and exhibit a remarkable variety of form and sculpture.

Group 83.—Sub-Family TURBININÆ and allies. turbo, a top. Estimated number of species: recent, 110; British, 1; fossil, 420 (?). Silurian, &c.

¶ Specimens of *Turbo* and *Phasianella*, showing the solid stony operculum characteristic of the group.

Group 84.—Family NERITIDÆ. *νηρίτης*, the Sea-snail.

The species of *Nerita* are marine, those of *Neritina* and *Navicella* inhabit fresh or brackish water. Estimated number of species: recent, 806; British, 1; fossil, 100. Oolite.

¶ *Clithon longispina*, distinguished by a remarkable development of tubular spines; and *Nerita peloronta*, known to the older conchologists by the name of “The Bleeding Tooth.”

Eighth Table Case.

The Mark ¶ indicates specimens or other illustrations exhibited in the cases.

Sub-order PECTINIBRANCHIATA. *pecten*, a comb; *βράγχια*, gills.

Section ROSTRIFERA. *rostrum*, a snout; *φέρω*, I carry.

Group 85.—Family ONUSTIDÆ and allies. *onus*, a load. Estimated number of species: recent, 158; British, 8; Fossil, 75. From the Carboniferous upwards.

¶ Examples of *Onustus*, *Calyptra*, *Crepidula*, *Narica*, &c., shewing the characters which have suggested the popular names, Cup-and-Saucer Limpet, Slipper-Limpet, Bonnet-Limpet; the Mineralogist Carrier, Conchologist Carrier, &c.

Group 86.—Family TURRITELLIDÆ and allies. *turris*, a tower. Estimated number of species: recent, 124; British, 8; fossil, 200. Tertiary.

¶ Examples of *Turritella*, *Vermetus*, *Cæcum*, *Siliquaria*, *Siphonium*, &c.

In *Vermetus*, the whorls of an ordinary spiral shell are seen disunited, and taking the form of a cork-screw.

Group 87.—Family AMPULLARIIDÆ and allies. *ampulla*, a globular vessel. Estimated number of species: recent, 181; British, 6; fossil, 70. Tertiary.

This family includes the so called Apple-snails, though differing widely from the true snails, which have lungs and are without opercula.

¶ *Ampullaria*, *Paludina*, *Paludomus*, *Bithynia*, *Nematura*, &c., all inhabitants of lakes or rivers.

Upper Compartment.

Ampullaria gigas, from the River Amazon.

Group 88.—Family LITTORINIDÆ and allies. *littus*, the sea-shore. Periwinkles. Estimated number of species: recent, 420; British, 60; fossil, 100. Permian, &c.

¶ *Littorina*, *Rissoa*, *Planaxis*, &c. *Litiopa* from the *Fucus natans* in the Sargasso Sea.

Group 89.—Family MELANIIDÆ. μέλας, black.

Melania, *Melanopsis*, &c. Estimated number of species: recent, 407; British, 0; fossil, 72. Tertiary.

¶ Illustrations of about 30 generic and sub-generic forms, all from fresh water.

Group 90. — Family CANCELLARIIDÆ and allies. *cancelli*, lattice work. Estimated number of species: recent, 274; British, 6; fossil, 720. Trias, &c.

¶ *Trichotropis*, *Aporrhais*, *Cerithium*, *Struthiolaria*, *Halia*, *Admete*, &c.

Trichotropis bicarinata, and a fine series of *Cancellaria*.

The fossil representatives of this group are very numerous, and are often found in the finest possible condition.

Group 91.—Family CYPRÆIDÆ and allies. Cowries.
Estimated number of species : recent, 200 ; British, 8 ;
fossil, 64. Cretaceous, &c.

¶ Examples of *Cypræa*, *Trivia*, *Ovulum*, *Pedicularia*. *C. aurantia*, worn as an ornament
by the chiefs in the Friendly Islands.

Upper Compartment.

Very aged *C. tigris* ; *C. pantherina*, with *Balani*
enclosed in a coating of enamel ; and many
others from the GASKOIN cabinet.

Group 92.—Family STROMBIDÆ. στρόμβος, a spindle.
The Strombidæ are active animals, possessing large and
well developed eyes : they are by some authorities placed
at the head of the *Prosobranchiata*. Estimated number
of species : recent, 84 ; British, 0 ; fossil, 170. Lias, &c.

¶ Examples of *Pterocera*, *Terebellum*, *Strombus*,
&c., and a very fine series of *Rostellaria*.

Upper Compartment.

Rough medallions and finished cameo, from the
shell of *Strombus gigas*.

Section TOXIFERA. τοξον, an arrow ; φερω,
I carry.

Group 93.—Family CONIDÆ. Cone-shells. Estimated
number of species : recent, 400 ; British, 0 ; fossil, 80.
Cretaceous, &c.

¶ Examples of *Conus* and *Dibaphus*, including
C. omaicus, *C. cedo-nulli*, *C. nobilis*, *C. aurisi-*
acus, *C. orbigny*, and others, illustrating the
generic and sub-generic forms of this highly
valued family.

Section PROBOSCIDIFERA. *προβόσκις*, a proboscis.

Group 94.—Family SOLARIIDÆ and allies. *Solarium*, a dial. Estimated number of species: recent, 38; British, 0; fossil, 400. Silurian.

¶ Examples of *Solarium* = *Architectonica*, *Torinia*, &c., shewing the winding whorls of *Solarium*, the staircase *Trochus*. The space is chiefly occupied by fossils, *Pleurotomaria*, *Euomphalus*, &c.

Group 95.—Family TEREBRIDÆ and allies. *terebra*, an auger. The Scalidæ, familiarly known as "Wentletraps," seem out of place here, and well deserve to be distinguished as a group by themselves. *S. pretiosa*, in really fine condition, is one of the most beautiful, as it used to be one of the most costly of shells. Estimated number of species: recent, 480; British, 50; fossil, 420. Silurian, &c.

¶ Specimens of *Scalaria*, *Pyramidella*, *Eulima*, *Stylifer*, &c., including *Terebra pretiosa* from the DENNISON cabinet; *Niso splendidus*, presented by S. SMITH; and *Stylifer* on an *Echinus*.

Group 96.—Family NATICIDÆ and allies. Estimated number of species: recent, 240; British, 11; fossil, 260. Devonian.

¶ Specimens of *Natica*, *Velutina*, *Lamellaria*, *Naticina*, *Sigaretus*.

Fifth Table Case.

The Mark ¶ indicates specimens or other illustrations exhibited in the cases.

Group 97.—Family CASSIDIDÆ and allies. *cassis*, a helmet. Estimated number of species: recent, 80; British, 0; fossil, 50. Cretaceous.

¶ Examples of *Cassis*, *Dolium*, *Oniscia*, *Ficula*, &c., including *Morum exquisitum*.

Upper Compartment.

Cameos in various stages (rough medallions, half-finished, and completed), from the shells of *C. Madagascarensis* and *C. rufa*. Presented by W. H. TOOKE. Sections shewing interior of shells.

Group 98.—Family MARGINELLIDÆ. *margo*, a rim. Estimated number of species: recent, 412; British, 1; fossil, 50. Cretaceous, &c.

¶ *Marginella*, *Erato*, *Columbella*, *Engina*.

Many species of *Marginella* are unsurpassed by any other shells in beauty of form and finish.

Group 99.—Family MITRIDÆ. *mitres*. Estimated number of species: recent, 439; British, 0; fossil, 100. Cretaceous, &c.

¶ Illustrations of most of the 21 generic and sub-generic forms constituting this extensive and highly ornate family of shells, found chiefly in the Philippine Archipelago.

Group 100.—Family VOLUTIDÆ. Volutes. Estimated number of species: recent, 100; British, 0; fossil, 80. Cretaceous, &c.

¶ Examples of *Voluta*, *Cymba*, *Melo*, including the very beautiful and rare *Lyria Lyræformis*. presented by S. SMITH.

Upper Compartment.

Observe the highly coloured interior of *V. Æthiopica*, DENNISON collection.

Group 101.—Family TURBINELLIDÆ and allies. *turbo*, a top. Estimated number of species: recent, 118; British, 0; fossil, 48. Cretaceous, &c.

Turbinella, *Fasciolaria*, *Fastigiella*.

Upper Compartment.

Armlets, made from the Chank-shell, and worn by natives in Ceylon.

Curious linear arrangement of egg-capsules, supposed to belong to some species of the present group. Presented by Captain MORTIMER.

Group 102.—Family DACTYLIDÆ. *δακτυλος*, a finger. Three very characteristic sub-families are combined in this group, the Olives, the Harps, and the Ancillæ, all tropical or sub-tropical in their distribution. It may be noticed that the present and five preceding groups are represented in British seas by a single species only, and appeared not earlier than the chalk formation. Estimated number of species: recent, 161; British, 0; fossil, 70. Cretaceous.

Oliva, *Harpa*, *Ancilla*.

¶ *O. Labuanensis*, discovered and presented by C. COLLINGWOOD.

Upper Compartment.

Malformations. GASKOIN Collection.

Family BUCCINIDÆ. *buccinum*, a trumpet.

Group 103.—Sub-family PURPURINÆ and allies. *pur-pura*, purple. Estimated number of species: recent, 178; British, 1; fossil, 42. Tertiary.

¶ Examples of *Purpura*, *Ricinula*, *Concholepas*, *Separatista*, *Pinaxia*, &c., comprising a rare variety of *Rapana Mawæ*; *Pseudoliva Kellettii*. Remarkable specimen of *Ricinula clathrata*, DENNISON collection.

Upper Compartment.

Group of many *Magilus antiquus*, in coral, Capt. JINMAN.

Group 104.—Sub-family NASSINÆ and allies. *nassa*, a basket. Estimated number of species: recent, 558; British, 7; fossil, 150. Tertiary.

¶ Examples of *Buccinum*, *Nassa*, *Eburna*, *Phos*, &c., including a very fine series of *Eburna*, one species only wanting. S. SMITH.

Group 105.—Family TRITONIDÆ. Tritons. Estimated number of species: recent, 165; British, 0; fossil, 68. Tertiary.

¶ Examples of *Triton*, *Ranella*, *Persona*, &c.

Group 106.—Family PLEUROTOMIDÆ. *πλευρα*, side; *τόμος*, a notch. Estimated number of species: recent, 491; British, 15; fossil, 800. Cretaceous, &c.

¶ Examples of *Pleurotoma* = *Turris*, *Mangelia*, &c. Large number of generic forms.

Family MURICIDÆ. *Murex*.

Group 107.—Sub-family FUSINÆ. *fusus*, a spindle.
 Estimated number of species : recent, 206 ; British, 6 ;
 fossil, 340. Oolite, &c.

¶ Examples of *Fusus*, *Hemifusus*, *Pisania*,
Neptunea Turtoni, &c.; amongst them, *Fusus*
pagodus and *Metula clathrata*.

Upper Compartment.

Fusus antiquus, fitted up as in Norway for use as a
 lamp.

Group 108.—Sub-family MURICINÆ. Estimated number
 of species : recent, 268 ; British, 6 ; fossil, 180.
 chiefly Tertiary.

¶ Examples of *Murex*, *Trophon*, &c., including a
 very fine series of *Typhis*, S. SMITH ; and
Murex endivia, DENNISON collection.

M. brandaris and *M. erinaceus* were probably the
 chief sources of the purple dye for which
 ancient Tyre was celebrated.

In the Molluscs of the next Sub-class occur for the first time in the ascending series animals which have attained to aërial respiration. As compared with other GASTEROPODA, the Land-snails and Slugs possess a similar odontophore or elastic strap, set with sharp teeth ; transformations less distinct ; a primary neural flexure of the intestine ; and breathe air by means of a pulmonary chamber formed by an inflexion of the mantle.

Tenth Table Case.

Sub-class GASTEROPODA PULMONIFERA.

πνεύμων, lungs ; φέρω, I carry.

Group 109.—Order OPERCULATA. *operculum*, a lid. Estimated number of species : recent, 835 ; British, 8 ; fossil, 50 ; Tertiary. The operculate PULMONIFERA attain their highest development in the Polynesian Islands, but are found in both hemispheres. The shells exhibit remarkable varieties in form and sculpture : some are cylindrical and glassy, others discoid ; many are beautifully keeled, as may be seen in the delicately fringed whorls of *Trochatella constellata*. The drawer is crowded, but contains examples of nearly all the generic and sub-generic forms.

¶ *Cyclostoma, Pupina, Helicina, Truncatella, Assiminia, &c.*

Order INOPERCULATA. *in*, without ; *operculum*, a lid.

Group 110.—Sub-order THALASSOPHILA. *θάλασσα*, the sea ; *φίλος*, a friend. Estimated number of species : recent, 98 ; British, 0 ; fossil, 3. Tertiary.

¶ Examples of *Siphonaria, Amphibola, &c.* The shells of *Siphonaria* resemble those of the Limpet tribe, but the animals are widely distinct. 72 species are exhibited, most of them presented by Mr. F. P. MARRAT.

Upper Compartment.

Drawings of the animals of *Siphonaria* and *Patella*.

Group 111.—Sub-order LIMNOPHILA. λίμνη, a pool; φίλος, a friend. Estimated number of species: recent, 577; British, 25; fossil, 160. Tertiary.

¶ Examples of *Auricula*, *Scarabus*, *Limnea*, *Planorbis*, *Physa*, *Physopsis*, &c. A brackish or fresh-water group, as indicated by the pale or sombre colouring even of the tropical species.

Group 112.—Sub-order GEOPHILA. γῆ, the earth; φίλος, a friend.

Family LIMACIDÆ and allies. *limax*, a slug. Estimated number of species: recent, 186; British, 13.

¶ Examples of *Limax*, *Arion*, *Nanina*, *Helicarion*, &c. The beautifully coloured shells of *Nanina* appear to advantage in a group where most of the species are without shells.

Upper Compartment.

Drawings of Animals.

Family HELICIDÆ. ἐλίκη, a winding.

Group 113.—Sub-family HELICINÆ. Part I. The influence of geographical position is well illustrated in this group, by the family likeness subsisting between the members of the smaller sets, Brazilian, N. American, Madeiran, and European. Estimated number of species: recent, 408; British, 10; fossil, a few. Tertiary.

¶ Examples of *Solaropsis*, *Anchistoma*, *Iberus*, *Theba*, &c.

Group 114.—Sub-family HELICINÆ. Part II. The up-turned mouth of *Anostoma* indicates that the adult animal must move with the spire of the shell downwards. The West Indian tribe allied to *Lucerna Macrocyclus* includes some of the largest and the smallest of the *Helices*. Estimated number of species: recent, 200; British, 6; fossil, a few. Tertiary.

¶ Examples of *Acavus*, *Cochlea*, *Lucerna*, *Macrocyclus*, &c., including a fine series of the rare Malayan genus *Geotrochus*.

Group 115.—Sub-family HELICINÆ. Part III. Estimated number of species: recent, 200; British, 8; fossil, a few. Tertiary.

¶ Examples of *Streptaxis*, *Helix*, *Helicostyla*, &c. In the Philippine Islands the *Helices* attain their highest beauty of form and colour; e.g., *Callicochlias*, *Corasia*, and *Helicostyla*.

Group 116.—Sub-family PUPINÆ. *Pupa*, a doll. Estimated number of species: recent, 574; British, 16; fossil, 50. Tertiary.

¶ Examples of *Pupa*, *Clausilia*, *Cylindrella*, &c., and of most of the generic forms in this extensive group.

Note the form and sculpture of some of the more slender species of *Cylindrella*, a West Indian genus.

Group 117.—Sub-family BULIMINÆ. Part I. βούλιμος, hunger. Estimated number of species: recent, 480; British, 5; fossil, 0.

¶ Examples of *Orthalicus*, *Bulimulus*, &c. For the geographical distribution of the *Bulimi*, see the tablets.

Note the delicate texture of the shells in the paper

Bulimi, *Orthalicus*; the grotesque shapes in *Otostomus*; the form, texture, and colour in *Aspastus*.

Group 118.—Sub-family BULIMINÆ. Part II. The Helices of the Philippine Islands are rivalled by the Bulimi of the same region, *e.g.*, *B. irroratus*, and *B. malleatus*. Estimated number of species: recent, 230; British, 0; fossil, 30. Tertiary.

¶ Examples of *Cochlostyla*, *Bulimus*, *Partula*, &c.

Upper Compartment.

B. ovatus, and other Bulimi, with their eggs.

Group 119.—Sub-family ACHATININÆ, and allies. *achates*, an agate. Estimated number of species: recent, 344; British, 3; fossil, 14. Tertiary.

¶ Examples of *Achatina*, *Succinea*, *Achatinella*, *Simpulopsis*, &c.

Upper Compartment.

Some of the larger *Achatina*, chiefly an African genus, fully equal in size the largest Bulimi of the western hemisphere.

Group 120.—Family OLEACINIDÆ and allies. *olea*, an olive. The present is a very heterogeneous group, but all the most important forms are well illustrated. Estimated number of species: recent, 503; British, 16; fossil, a few. Tertiary.

¶ Examples of *Oleacina*, *Glandina*, *Discus*, *Zonites*, *Vitrina*, *Testacella*, *Sagda*, &c. Series related to *Testacella* and *Parmacella*.

Eleventh Table Case.

The Mark ¶ indicates specimens or other illustrations exhibited in the Cases.

Group 121. Family BELEROPHONTIDÆ (MacCoy).

Estimated number of species 70, known only as fossils, chiefly Silurian and Carboniferous. The position of the group is uncertain, the animal being quite unknown except through the remains of its shell.

Class CEPHALOPODA.

κεφαλή, the head; ποὺς, a foot.

Organs of progression encircling the head.

Order TETRABRANCHIATA (OWEN). Gills 4; arms many, without suckers, resembling tentacles. The shells in this very extensive order, of which only a single living form remains (the Nautilus), are all chambered, *i.e.*, divided transversely into compartments, in the outermost of which the animal resides, keeping up a communication with the previously inhabited chambers by means of a siphuncle or tube.

Family AMMONITIDÆ (OWEN). ἈΜΜΩΝ, a title of Jupiter when represented as having the horns of a ram.

Group 122.—Genus HAMITES (PARKINSON); and allies. *Hamus*, a hook. This group includes the genera of the Ammonite family in which the tube of the shell is nearly straight or sharply bent near the extremity; also genus *Turrilites*, in which the chambered tube forms a beautifully spiral shell. Estimated number of species 140, all known as fossils of the Cretaceous system.

Group 123.—Genus AMMONITES (BRUGUIERE). Sutures of the shell more or less ramified. Estimated number of species 530, occurring from the Trias to the Chalk.

¶ Specimens of Ammonites from the Wealden, Oolite, Lias, Chalk, and Green-sand formations.

Group 124.—Genera GONIATITES (DE HAAN); and CERATITES (DE HAAN). Sutures of the shell sinuous, but not ramified. Estimated number of species 175, known only as fossils from the Devonian to the Trias.

Family NAUTILIDÆ.

Group 125.—Genus ORTHOCERAS (BREYN); and allies. ὀρθὸς, straight; κέρας, a horn. The Orthoceratites were extremely abundant in the very ancient seas, the Carboniferous Limestone in some parts being almost made up of their remains. The shells sometimes attained a length of six feet. Estimated number of species 200, from the Silurian to the Trias.

Group 126.—Genus NAUTILUS. ναυτίλος. ARISTOTLE, B.C. 312. Nautilus, the sole living representative of the vast assemblage of tentacle-bearing Cephalopods, has, it is said, been recognised in every geological formation from the Silurian upwards. The series thus extended includes more than 100 species; 6 species are still living, though the animal has rarely been observed, and was first described by Professor OWEN. The Nautilus creeps, shell uppermost, on the bottom of the sea; but it occasionally ascends, and has been seen in shoals floating on the surface after a storm.

¶ Examples of *Nautilus pompilius*, *N. umbilicatus*, *N. macromphalus*, and of a few fossil forms.

Upper Compartment.

Sections of the shell to shew the chambers and the siphuncle. Specimen in liquid of the animal within the shell.

Order DIBRANCHIATA. gills two; arms, with suckers.

Section DECAPODA. arms ten.

Group 127.—Genus SPIRULA and allies. The shell of *Spirula* is internal and chambered. Estimated number of species: recent, 4; fossil, a few, from the lower Tertiary.

Upper Compartment.

¶ *Spirula* in spirits with the animal entire, very rare. Section shewing the ventral siphon passing through the chambers of the shell.

Group 128.—Family BELEMNITIDÆ. βέλεμνον, a dart. *Belemnites*. *Belemnoteuthis Actinocamax*. The shell is internal and chambered and is protected posteriorly by a cylindrical guard tapering to a point. This guard is the only part commonly found. Estimated number of species 40, all known as fossils, chiefly from the Lias.

¶ Specimens from Dr. MANTEL's collection, in very fine condition, shewing the horny pro-ostracum, the ink-bag, and the phragmacone.

Group 129.—Family SEPIADÆ. Cuttles. Σηπία. ARISTOTLE, from σιπύη, a pouch. The shell is internal, consisting of an oval calcareous plate, shewing at the apex traces of the chambered structure characteristic of the order. Estimated number of species: recent, 30; British, 3; fossil, 9. Oxford clay, &c.

¶ Fossil remains and recent specimens of cuttle-bone.

Upper Compartment.

Coloured drawings of the animal, and preparations in liquid.

Group 130.—Family TEUTHIDÆ. Calamaries and Squids.

τεuthίς (ARISTOTLE). The shell is an internal horny pen. *Loligo*, *Cranchia*, *Sepiola*. Estimated number of species: recent, 90; British, 10; fossil, 14. Lias, &c.

¶ Parrot-like horny beaks of Squids. Eyes of Cephalopods taken from Peruvian mummies.

Upper Compartment.

Pen of Squid four-and-a-half feet in length, collected by Capt. MORTIMER in the North Atlantic. Animals of the group in spirits.

Section OCTOPODA. arms, eight.

Group 131.—Family OCTOPODIDÆ Poulpes. *Octopus*, *Eledone*. Estimated number of species: recent, 58; British, 1.

¶ Dried Octopods, from the market at Constantinople.

Upper Compartment.

Drawings, and preparations in spirits.

Group 132.—Family ARGONAUTIDÆ. Argonaut, Paper-Nutilus. The beautiful shell of the female Argonaut is secreted by the extremities of the dorsal arms, which are disciform. The animal is not attached to the shell, but sits in it, clasping the sides with its webbed arms.

¶ Very large specimen of *A. argo*, and examples of four other species.

Upper Compartment.

Drawings of the female Argonaut with its shell. Preparation in liquid of male Argonaut, shewing the hectocotylised arm.

Twelfth Table Case.

The Mark ¶ indicates specimens or other illustrations exhibited in the Cases.

Sub-kingdom ANNULOIDA.

Animals possessing a distinct nervous system, a water vascular system, and a food canal shut off from the body cavity: body of the adult having its somites (merosomes) disposed radially.

As the principal departure from the ordinary method of arrangement occurs at this point, it may be proper for the Writer to mention, by way of explanation, that he cannot bring himself to regard the high development of special organs in the CEPHALOPODA, due probably to *the absence of morphological obstructions*, as in any wise equivalent in importance even to the first prefigurements of the great annulose type; in which many somites, each in itself an individual of a lower grade, unite as constituents, first of a type with an exo-skeleton (ARTHROPODA), subsequently of a type with an endo-skeleton (VERTEBRATA), by degrees consigning their combined energies to be under the superintendence, first of a cephalic ganglion, at length of a brain.—
H. H. H.

Class ECHINODERMATA.

ἐχίνος, the hedgehog; *δερμα*, the skin.

The general arrangement of the groups in this Class is in accordance with the classification adopted by MM. DUJARDIN and HUPÉ, in "Histoire Naturelle des Zoophytes Échinodermes." (Suites à Buffon. Paris, 1862.)

Sub-Class CRINOIDA.

κρίνος, a lily; εἶδος, form.

Body of the animal, during the whole or a portion of its existence, attached to the sea-bottom by a jointed and flexible stalk.

Group 133.—Orders CYSTOIDEA, BLASTOIDEA, and CRINOIDEA in part. The *Cystoidea*, earliest of the Echinoderms, attained their maximum in the Lower Silurian. They were closely followed by the *Blastoidea*, or *Pentremites*, and the *Crinoidea*, or Stone-Lilies: the latter alone survived, though in diminished numbers, the Palæozoic age. Estimated number of species, 140. M. DUJARDIN.

Group 134.—Family PENTACRINIDÆ (D'ORBIGNY). The beautiful *Pentacrinus Mulleri* is one of the few living forms which very closely connect the animal life of the present age with that of ages immeasurably remote. Living in the deeper waters of the Caribbean Sea, it has seldom been brought to light, and was long regarded as a solitary relic of the vast Crinoid population of the ancient oceans. Deep-sea dredging has recently afforded examples of allied forms. *Pentacrinus Wyville-Thomsoni* was taken at a depth of 1,095 fathoms, E. Atlantic, and *Bathycrinus gracilis* at 2,435 fathoms. Estimated number of species: recent, 6; fossil, 6. Lias.

The collection is fortunate in possessing one fine specimen of *P. Mulleri* and two of *P. Wyville-Thomsoni*. Whilst inspecting them Dr. Carpenter, who described and named the latter species, remarked to the writer that, in consequence of a structural peculiarity, the stem of

a Pentacrinite never snapped asunder except at a joint close below one of the whorls of arms which at intervals of about three inches radiate from the stem. If therefore the stem of a living Pentacrinite broke, a whorl was thereby brought in close and even contact with the sea-bottom, to which the arms could cling and again support the animal in an erect position.

Group 135.—Family COMATULIDÆ. Feather-stars. Although the adult Feather-stars move freely from place to place, in their early condition they are attached by the centre to a fixed stem, in which stage they so much resemble the species of the preceding group, that the larval state of *Comatula rosacea* received the name of *Pentacrinus Europæus*. Estimated number of species: recent, 85; British, 8; fossil, 20.

Sub-Class ASTEROIDA. Star-Fishes.

Order OPHIUROIDEA. ὄφις, snake; οὐρά, tail; εἶδος, form.

Group 136.—Family OPHIURIDÆ. Part I. Sand-stars. In the Ophiuridæ the number of arms is always five; the arms do not, as in the true Star-fishes, contain extensions of the body cavity, but are simply locomotive appendages. Estimate of species: recent, 80; British, 2; fossil, 9.

¶ Examples of *Ophioderma*, *Ophiura*, *Ophiolepis*, and other genera.

Group 137.—Family OPHIURIDÆ. Part II. Brittle-stars.

The Brittle-stars are much more active than the Sand-stars, and have a tendency to break themselves up into little pieces when captured. They die instantaneously when placed in fresh water. The *Ophiuridæ* inhabit almost all seas, and are found occasionally at great depths. Estimated number of species: recent, 65; British, 11; fossil, 11. Silurian and upwards. The total number of species of Ophiuridæ, in a list by THEODORE LYMAN, of Harvard College, U. S., is 164.

¶ Examples of *Ophiocoma*, *Ophiothrix*, *Ophiacantha*, *Ophiomyxa*, and other genera.

Group 138.—Family ASTEROPHYDEÆ (DUJARDIN). This group includes species with arms varying from perfectly simple stems to the highly branched appendages of *Asterophyton*, one species of which, known as the Shetland Argus, when curled up somewhat resembles the Rose of Jericho (*Anastatica Hierochuntia*). In moving, the Asterophyton lifts itself along on tiptoe, resting on the extreme ends of the branches, which thus form a kind of cage. The branches divide dichotomously, beginning with the 5 arms; these, by division, produce 10, and these again 20, and so on. In a New England specimen, mentioned by A. AGASSIZ, the terminal branchlets were computed at no less than 81,920. Estimated number of species: recent, 16 British, 1.

¶ Examples of *Asterophyton* (LINCK); *Euryale* (LAMARCK).

Order ASTEROIDEA. ἀστήρ, a star; εἶδος, form.

Ambulacral furrows with four rows of tube-feet; anus dorsal.

Group 139.—Genera ASTERACANTHION (MULLER); and HELIASTER (GRAY). This group includes the common star-fish or cross-fish, found abundantly on the shores of the Mersey. The arms of star-fishes have, on the under side, furrows pierced with rows of openings through which can be extended or retracted locomotive organs called tube-feet. A complicated apparatus (the water-vascular system) fills or empties, and thus protrudes or withdraws, these tube-feet, or any portion of them, at the will of the animal. Estimated number of species; recent, 50: British, 4; fossil, 9. Silurian and upwards. In this, as in most groups of the order, the collection is indebted for fine examples to the liberal contributions of Professor AGASSIZ.

Ambulacral furrows with two rows of tube-feet; anus dorsal.

Group 140.—Genera CRIBELLA (AGASSIZ), SOLASTER (FORBES), and allies. The genus *Cribella* forms a link between the cross-fish, *Uraster*, and the sun-stars, *Solaster*. Most of the Echinoderms possess, and *Cribella* exhibits very distinctly on its upper surface, near the junction of two arms, a small aperture like the rose of a watering-pot (madreporiform tubercle), which acts as a filter for the supply of the water-vascular system. Estimated number of species: recent, 58; British, 4; fossil, 1.

Group 141. Genus PALMIPES (LINCK), and allies.

In this group the arms or rays are slender, so that the web which joins them constitutes the chief part of the body. *Palmipes*, the Bird's-foot Sea-star, the thinnest and flattest of the order, ranges from the Arctic Seas to the Mediterranean. Estimated number of species: recent, 47: British, 1; fossil, 7. Higher Crag.

¶ Examples of *Culcita*, *Asteriscus*, *Oreaster*, &c.

Group 142.—Genera ASTROGONIUM (MULLER), and GONIODISCUS (MULLER). The long, sharp, and strong spines conspicuous in some of the species of this group serve to protect the animal from the attacks of enemies, or from the effects of sudden concussions. The animal can lower its spines in any required direction, as river steamers lower their funnels when passing under a bridge. Estimated number of species: recent, 80; British, 2; fossil, 84. Chalk and Higher Crag.

¶ Examples of *Paulia horrida*, *Antennea*, &c.

Group 143.—Genera ASTEROPSIS (MULLER), and ARCHASTER (MULLER). Star-fishes, writes A. AGASSIZ, have a singular mode of eating: they place themselves over whatever they mean to feed upon,—as for instance a cockle,—the back gradually rising as they arch themselves above it; they then turn the digestive sac or stomach inside out, so as to enclose their prey completely, and proceed leisurely to suck out the animal from the shell. Estimated number of species: recent, 11; fossil, 2. Green-sand.

Ambulacral furrows, with two rows of tube-feet: anus absent.

Group 144.—Genera ASTROPECTEN (LINCK): LUIDIA (FORBES). Three representatives of the present group are found in British seas; *Asterias aurantiaca* (LINNÆUS), *Astropecten* (LINCK), called by fishermen the Butthorn, and two species of *Luidia*, one of which when full grown measures two feet across, but specimens of this size are with great difficulty obtained entire, owing to the habit which *Luidia* possesses of voluntarily breaking itself into little pieces when an attempt is made to remove it from its natural element. This species, in common with many others, has at the end of each ray a pigment spot, which is probably a rudimentary organ of vision, and is guarded by a movable eye-lid. Estimated number of species: recent, 46; fossil, 20. Oolite and upwards.

Thirteenth Table Case.

The Mark ¶ indicates specimens or other illustrations exhibited in the Cases.

Sub-class ECHINOIDA. Sea-Urchins.

ἐχῖνος, a hedgehog; ἴδος, form.

Family CIDARIDÆ. κίδαρις, a Persian turban.

Group 145.—Genus CIDARIS (LAMARCK) and allies. The globose *Cidaridæ* differ widely in appearance from the long-armed *Asteridæ* of the preceding order; but if the arms of a star-fish were turned up over its back till the tips nearly met, and if the sides of the turned-up arms were united by plates bearing tubercles crowned with long spines, the morphological affinity between the star-fish

and the sea-urchin might to some extent be thus illustrated. In the sea-urchin five spaces with ambulacral pores alternate with five spine-bearing segments, all vertically disposed, the mouth being always on the under side. Estimated number of species: recent, 17; fossil, 424. Chiefly from the Oolitic and Tertiary formations.

¶ *Cidaris papillata* (FLEMING), the only representative of the group in the British seas, was formerly supposed to be found exclusively near the Shetland Islands, where it is called the Piper, its spines being compared with the drones of a bag-pipe.

Group 146.—Genus **DIADEMA** (GRAY) and allies. *διάδημα*, a diadem. The metamorphosis of an echinus has no parallel out of its own class. The egg of the sea-urchin produces a free-swimming ciliated embryo, which becomes a larva with an internal calcareous skeleton, shaped like a painter's easel (*Pluteus*). On the interior lining of its stomach is formed a germ (*blastema*), which assumes a radiated form, absorbs in part, or casts off, the larval body with its skeleton, develops a new mouth, and grows into an *Echinus*. The adult form is therefore constructed on a lower type than that of its larva, from which the sea-urchin seems only to borrow materials necessary for its growth. Estimated number of species: recent, 39; British, 0; fossil, 107.

¶ Examples of *Salmacis*, *Echinocidaris*, *Amblypneustes*, *Garelia*, *Trichodiadema*.

Group 147.—Genus **ECHINUS** (LINNÆUS) and allies. *ἐχῖνος*, a hedgehog. In the shell of *Echinus sphæra*, the common Egg-urchin of British coasts, are combined upwards of 600 plates, bearing more than 4000 movable spines. At the apex is an anal opening, surrounded by plates perforated to admit the passage of the ova. One plate,

larger than the rest, is of a spongy character, and admits water for the supply of the water-vascular system. Five smaller adjacent plates have orifices answering to the eye-specks of star-fishes. On the under side of the *Echinus* may be seen the points of five projecting teeth, forming the extremities of a marvellously complicated dental apparatus, which has been termed Aristotle's lantern. Estimated number of species: recent, 19; British, 8; fossil, 26. Cretaceous and Tertiary.

¶ Examples of *Sphærechinus*, *Lytechinus*, *Psammechinus*.

Group 148.—Genus TOXOPNEUSTES (AGASSIZ) and allies. *τοξον*, an arc; *πνευσις*, respiration. *Echinus lividus*, the Purple Sea-urchin, was seen by the writer, lying hundreds together in tide-pools on the coast of Kerry, Ireland. This species frequently lives in cup-shaped cavities of rocks corresponding with the size of the animal. It seems to perforate the rock by the continued motion of its spines, which being covered by a living membrane, are renewed at the tip as the points are worn away. Estimated number of species; recent, 80; British, 1; fossil, 9.

¶ Examples of *Loxechinus*, *Toxocidaris*, *Heliocidaris*, *Tripneustes*.

Group 149. — Genus ACROCLADIA (AGASSIZ). *ἄκρος*, pointed; *κλαδος*, the young shoot of a tree. The species of this group, distinguished by their massive spines, are found in Tropical seas, and during life are superbly coloured; but they are much disposed to cast off their spines on being removed from the water. Estimated number of species: recent, 6.

¶ Examples of *Podophora* and two species of *Acrocladia*, very fine.

Group 150.—Genus ECHINOMETRA (BREYNIUS)[¶] and allies. On the integument of many of the *Echinodermata* are found curious little appendages called *Pedicellariæ*, in shape not unlike the head and stem of an Encrinite, but possessing only two or three arms, which open and close with much activity. As in the case of the *avicularia* of the *Polyzoa*, their true character is yet unknown. Estimated number of species in the present group: recent, 14; fossil, 195.

Family CLYPEASTRIDÆ. *clypeus*, a shield; *astrum*, a star.

Group 151.—Genus ECHINARACHNIUS (VAN PHELS) and allies. *εχῖνος, ἀράχνη*, a spider's web. The globose form of the common Sea-urchin differs very widely from the flattened disc of the Cake-urchin, *Echinarachnius placenta*, a northern form rarely found in British seas; but upon examination the true ambulacral pores of the Cake-urchin may be seen, forming a rosette on its upper surface; and other very curious modifications of the ordinary echinoid structure may be recognised as associated with an extreme reduction in the size of the body cavity of the animal. Estimated number of species: recent, 32; British, 2; fossil, 63.

¶ Examples of *Melitta*, *Dendraster*, *Rumphia*, *Lobophora*, *Scutella*.

Group 152.—Genus CLYPEASTER (LAMARCK) and allies. Shield-stars. Between the *Clypeastridæ* of the present and the *Spatangidæ* of the succeeding group occurs the family *Cassidulidæ*, in which the mouth is central, but the dental apparatus is wanting. The species, of which M. DUJARDIN recognises more than 260, begin to appear

in the lower Oolite, attain their maximum in the Chalk, diminish progressively in the Eocene and Miocene, whilst the living representatives are confined to two or three species found in tropical seas. Estimated number of species : recent, 18 ; British, 0 ; fossil, 285.

¶ Examples of *Rotula*, *Encope*, *Pygorhynchus*, &c.

Group 153.—Family SPATANGIDÆ. σπάταγγος, a sea-urchin. The Spatangidæ, or Heart-urchins, live in sand or mud, with which when opened their intestines are found to be filled ; these substances seem to have been swallowed for the sake of the animal matter mixed up with them. Estimated number of species : recent, 33 ; British, 4 ; fossil, 176. From the Chalk upwards.

¶ Examples of *Meoma*, *Desoria*, *Xanthobrissus*, *Tripylus*, *Plagionotus*, *Schizaster*, *Kleinia*.

Group 154. — Sub-Class HOLOTHUROIDA. ὀλοθούριον, Greek name for the animal. Many links are missing between the Sea-urchins and the Sea-cucumbers, *Holothuridæ*. The latter are worm-like animals, possessing a tough flexible skin, and bearing around the mouth a five-rayed coronal of feathery tentacles. The order includes two families : I. *Synaptidæ*, simple in form, and moving by means of anchor-shaped spicules attached to papillæ or minute warts. II. *Holothuridæ*, several species of which are known in commerce as Bêche-de-mer or Trepang, used in China as turtle is used in this country. Estimated number of species : recent, 97 : British, 15.

¶ Examples of Trepang as prepared by Malays for the Chinese market. Coloured drawings of some of the species, and of their internal anatomy. Specimens preserved in liquid.

Class **SCOLECIDA.**

σκώληξ, a worm; εἶδος, form.

Unisegmental Worms (ROLLESTON).

The head of the Tape-worm constitutes the true animal, the joints being simply hermaphrodite generative products, which the head throws off by a process of gemmation.

Group 155. — PARASITIC SCOLECIDA; often termed ENTOZOA. Tape-worms and Cystic-worms, *Tæniada*; Flukes, *Trematoda*; Thorn-headed Worms, *Echinorhynchus*; Hair-worms, *Gordiacea*; Thread-worms, *Ascaris*, *Oxyuris*, *Trichina*; Guinea-worm, *Filaria*; &c. The members of this group may in a general manner be described as passing through certain stages of their development in the bodies of living animals. The embryos when set free remain imperfectly developed until received into some living animal other than the one in which they began their existence.

¶ Illustrative drawings and diagrams.

Group 156.—FREE SCOLECIDA. The free, or non-parasitic *Scolecida* include animals belonging to both the two systematic divisions of the class. In the division *Platyelmia*, or Flat-worms, are the *Turbellaria*, including the *Planarians*, which in shape resemble minute soles, and are found in pools and moist places; also the *Nemertians*, or *Ribbon-worms*, interesting as resembling the Sea-urchins in a certain stage of their larval development. In the division *Nematelmia*, or Thread-worms, most of which are parasitic, are the *Anguillulidæ*, Vinegar-eels, Paste-eels, &c., numbering more than 200 species, chiefly remarkable for tenacity of life. On the authority of Professor ROLLESTON, a place in this class is assigned to *Sagitta*, a transparent worm-like marine

animal about an inch in length constituting, according to Professor HUXLEY, the class CHÆTOGNATHA. Formerly included with the INFUSORIA, but now generally regarded as a sub-class of SCOLECIDA, occur the ROTIFERA or wheel-bearing animalcules, familiar, and from their extreme beauty a source of high gratification, to all microscopist observers of pond-life. ROTIFERA and TURBELLARIA possess a "water-vascular system."

¶ Coloured drawings of *Planaria*, *Sagitta*, and Rotifers, including *Melicerta* and *Floscularia*. Diagrams illustrating the biology of the group.

Fourteenth Table Case.

The Mark ¶ indicates specimens or other illustrations exhibited in the Cases.

Sub-kingdom ANNULOSA.

Animals composed of numerous annular somites or segments arranged longitudinally.

Province ANARTHROPODA.

Multisegmental WORMS (ROLLESTON).

The CHÆTOGNATHA being removed to the ANNULOIDA, on authority as given above, this Province includes a single Class only.

Class ANNELIDA.

The only systematic work on the species of the whole class known to the Writer is "Histoire Naturelle des ANNELES Marins et d'eau douce." M. A. DE QUATREFAGES. 3 vols. 8vo. and 1 vol. of plates. About 1200 species are described.

No Annelide has a heart or a head comparable with these organs as found amongst Crustaceans or Insects. The water-vascular system generally present in the ANNULOIDA is here replaced by a pseudo-hæmal system conveying a fluid sometimes corpusculated. The lateral appendages of the segments, when present, are not articulated but pertain to the skin.

Group 157.—ANNELEIDA ABRANCHIATA. Worms unprovided with external organs of respiration.

I. Order HIRUDINEA = DISCOPHORA. Aquatic worms without lateral appendages of any kind, but having a sucking disk posteriorly or at both extremities. Ten genera are included, the forms best known being the Black-leech, the Horse-leech, and two species of the common or medicinal Leech usually imported from Hungary. The latter have ten minute eyes arranged in the form of a horse-shoe over the upper part of the anterior sucker.

II. Order OLIGOCHÆTA. Earth-worms, *Lumbricidæ*, possessing eight rows of short bristles acting as locomotive organs. The animals are eyeless, and have a mouth without appendages. Water-worms, *Naididæ*, including *Tubifex*, a little bright-red worm inhabiting the mud of impure streams.

III. Order GEPHYREA. γέφυρα, a bridge; often regarded as a Class, but recognised by Mr. HUXLEY as a division of inferior rank. The animals have affinity with the Holothurians, a fact to which the name may possibly allude, if it does not rather refer to the long strangulated neck of the Spoon-worms, *Sipunculidæ*, frequently found on British coasts burrowing in the sand or inhabiting the deserted shells of Whelks.

Group 158.—ANNELEIDA BRANCHIATA. Worms provided with external gills in the form of respiratory tufts or plumes.

I. Order TUBICOLA. In this Order the gills are placed near the head of the animal, forming plumes often of extreme beauty in colour and disposition. The tube may be calcareous as in the little *Spirorbis* abun-

dant on Fuci; and in *Serpula*, the meandering tubes of which frequently almost cover the valves of marine shells; or it may be formed of grains of sand and fragments of shells as in *Terebella*; or it may be of a leathery consistence, made up of mud strengthened by a glutinous secretion, as in *Sabella* which at Hilbre may be seen rendering the deeper tide-pools gay as a border of flowers. In *Serpula* one of the plumes carries a little calcareous lid closing the mouth of the tube when the animal retires.

II. Order ERRANTIA. In the free Annelides the gills are arranged in tufts along the back or sides of the body. In the Sea-mouse, *Aphrodite*, the back is protected by scales concealing the gills, the scales being themselves hidden by bundles of flexible bristles glittering like spicular iron ore, and displaying all the colours of the rainbow. The Lob-worm, *Arenicola*, burrows in the wet sand, and is much used by fishermen for bait. In the Sand-worms, *Nereida*, the anterior extremity is sometimes furnished with eyes, and a mouth with jaws and feelers, and thus makes a nearer approach to a true head than is found in any other of the VERMES. *Eunice gigantea* attains a length of four feet, and has as many as four hundred segments. The tracks and burrows of the free Annelides on the ancient sea-bottoms are found in rocks of almost all ages from the Cambrian upwards. The tubes of the *Tubicola* occur as early as the Silurian period. The little *Microconchus* was found by the writer in the middle coal-measures at Ravenhead.

Province **ARTHROPODA.**

ἄρθρον, a joint; ποὺς, a foot.

Animals with jointed limbs articulated to the body.

This great Province vastly outnumbers in species the total of the preceding invertebrate Provinces, and exceeds them in the interest of its annals. The gathering up of several body-segments, somites, to form a true head, here first appears, and with it apparently a capacity for the higher orders of instinct. Prefigured in VERMES, this arrangement attains perfection by multitudinous steps and very slow degrees. The term ARTHROPODA is retained as a convenient designation, but is inferior to ANNULOSA in expressing the chief character of the present Sub-kingdom.

Class **CRUSTACEA.** *crusta*, a crust.

Respiration generally by gills. Antennæ, two pairs. Jointed appendages, more than eight. The body of a typical Crustacean is made up of about twenty-one segments or somites, often nearly equally distributed between the head, the thorax, and the abdomen.

The general arrangement of the Class is in accordance with the "Histoire Naturelle des Crustacés," par M. MILNE EDWARDS; but advantage has frequently been taken of the great work on the same subject by JAMES DANA, of the United States Exploring Expedition: this work is a monograph of surpassing excellence.

Sub-class **CIRRIPIEDIA.** *cirrus*, a curl; *pes*, a foot.

In the larval state the Cirripedes are free and locomotive: subsequently two of the larval antennæ discharge a kind of glue, by which the head of the animal becomes permanently attached to some solid object.

Group 159.—Family **BALANIDÆ** and allies. βάλανος, an acorn. In the family of Sessile-cirripedes, or Acorn-shells, the head of the animal is fixed to the centre of a shelly plate, the basis of a conical shell made up of

several pieces and open at the top when not closed by the pyramidal operculum. To the thorax are attached six pairs of forked limbs bearing twenty-four plumes or cirri. Rocks and stones near low-water mark for miles together on various parts of the British coasts are thickly coated with *Balanus crenatus*; other species are found attached to Cetacea, Turtles, shells, and corals. *Balanus psittacus* attains a height of eight inches, and is much prized as an article of food in Chili. Estimated number of species: recent, 100 (DARWIN); British, 16.

Group 160.—Family LEPADIDÆ. λεπιδες, the Limpet. Stalked Cirripedes, or Barnacles. The antennæ of the free larva are prehensile. Having attached itself to some solid object, as a piece of timber or the bottom of a ship, the anterior extremity of the animal becomes enormously elongated forming a stalk or peduncle bearing a “capitulum,” constructed of calcareous plates united by a membrane. Delicate plumes made up of twenty-four cirri are incessantly protruded and retracted and by their action currents of water are made to enter the capitulum bringing food to the animal. The plates of the capitulum are extensively used in the construction of artificial flowers.

The remainder of the Sub-class includes two interesting but minute species, constituting the orders ABDOMINALIA and APODA. Estimated number of species: recent, 45 (DARWIN); British, 11.

Sessile Cirripedes are first met with in Eocene deposits; and Stalked Cirripedes have been found as early as the lower Oolite; but neither appear in any age to have abounded so greatly as at the present time.

Sub-class ENTOMOSTRACA.

In the third or highest Sub-class of CRUSTACEA, viz., MALACOSTRACA, the post-cephalic segments are fourteen in number: in the ENTOMOSTRACA the number is greater or less than fourteen.

Group 161.—ENTOMOSTRACA, in part.

I. Order OSTRACODA. ὄστρακον, a shell. Animalcules abundant in fresh-water pools. The body is enclosed in a bivalve shell. *Cypris*, &c.

II. Order COPEPODA. κωπη, an oar; πούς, a foot. Water-fleas, *Cyclops*, &c.; head and thorax protected by a carapace. The Fish-lice, *Ichthyophthira*, including *Lernæa*, *Achtheres*, *Peniculus*, and various other genera parasitic on fishes, are recognised by Professor HUXLEY as peculiarly modified COPEPODA.

III. Order CLADOCERA. κλάδος, a branch; κέρας a horn. Antennæ used in swimming. *Daphnia*, &c.

IV. Order PHYLLOPODA. φύλλον, a leaf; πούς, a foot.

Fairy-shrimps, &c. *Apus*, interesting from its affinity to the extinct Trilobites, is said to have sixty pairs of feet. Estimated number of species: recent, 190 (M. EDWARDS); fossil, 70. From the Silurian upwards.

Some of the smaller species, both fresh-water and marine, swarm in numbers beyond computation. Active and voracious, they in their turn become the prey of enemies of many kinds: the redness and flavour of trout are supposed to be improved by a diet of ENTOMOSTRACA: the crystalline texture of *Beroë* discovers them undergoing the process of being digested; and water-drinking animals of all orders, in the absence of extreme precautions, derive some part of their nourishment from minute Crustaceans.

Group 162.—Order TRILOBITA. *τρῑς*, three ; *λοβὸς*, a lobe.

The species of this order are known only as Palæozoic fossils. The eyes when present are compound, but no antennæ or gills have been detected, and very little is known of their locomotive organs. BURMEISTER thought that the Trilobites swam, back downwards, in shoals near the coast, rolling themselves into a ball as a defence when attacked. Dr. BUCKLAND compared them with *Serolis* (see Group 164).

Group 163.—Order MEROSTOMATA. *μηρος*, thigh ; *στόμα*, mouth.

I. Sub-order XIPHOSURA. *ξίφος*, a sword ; *οὐρά*, a tail. The King-crab, *Limulus*, seen from above, exhibits little more than a huge buckler rounded in front and furnished with a pair of large dull eyes and three ocelli ; a second smaller buckler toothed at the sides ; and a posterior appendage, or telson, shaped like a bayonet. From below, the animal thus esconced appears as if chiefly made up of an assemblage of jointed limbs, of which six pairs encircle the mouth, the basal joints or thighs acting as jaws, whilst the extremities serve for prehension or locomotion. Six other pairs carry gills and are used in swimming. The species are not numerous but frequent sandy coasts in many parts of the world, and occasionally leave the water, burying themselves in the sand to avoid the heat of the sun. The King-crabs were in existence before the Trilobites disappeared. The long continuance of so grotesque a form, resembling a magnified animalcule, is worthy of notice.

II. Sub-order EURYPTERIDA. *εὐρύς*, broad ; *πτερόν*, a wing. The species are known as Palæozoic fossils.

¶ Four species of *Limulus*, and a small example of *Pterygotus*, a genus of fossil Crustaceans, some species of which attain a length of six feet.

Sub-class **MALACOSTRACA**. The third and highest sub-class of the Crustacea. The body-segments (somites) are regarded as being twenty-one in number, of which seven are cephalic (belonging to the head), seven thoracic, and seven abdominal; but the whole of these can be distinguished in no single example. The modifications of the segments and their appendages are extremely complicated: one rule however obtains in all instances, namely, that each pair of appendages indicates a separate segment.

Division **EDRIOPHTHALMATA**. ἔδρα, a seat; ὀφθαλμὸς, an eye. Eyes not on foot-stalks; body not protected by a carapace.

Group 164.—Order **ISOPODA**. ἴσος, equal; ποὺς, a foot. The animals of this group generally possess seven more or less uniform pairs of feet which in the three sections of the order are modified to suit various modes of life.

I. *Cursorial*. The Sea-slater, *Ligia*, common on walls near the sea. The wood-piercing Isopod, *Limnoria terebrans*, wherever it prevails, notwithstanding its small size, is a most destructive enemy to ships, piers, and timber embankments. The Wood-lice, *Oniscus*, and the Pill-balls, *Armadillo*, though terrestrial, breathe by modified gills.

II. *Natatorial*. The Sea Pill-balls, *Sphæroma*, swim freely, but the Fish-lice, *Cymothoa*, remain for the greater part of their existence attached to fishes.

III. *Sedentary*. The Prawn parasite, *Bopyrus*, may sometimes be detected under the carapace of a prawn, where the Isopod probably feeds together with, rather than upon, its host.

Estimated number of species: recent, 210; British, 42.

¶ Examples of *Idotea entomon*, from the Baltic, the largest of the Isopods; *Serolis*, from the Falkland Islands.

Group 165.—Orders LÆMODIPODA. λαιμὸς, the throat; δὶς, twice; ποὺς, a foot; and AMPHIPODA: ἀμφί, both-ways; ποὺς, a foot. The species in the former order are few and possess heads indistinctly separated from the thorax; hence the first pair of limbs seem to be attached to the throat. The order includes the Skeleton-screw, Spectre-shrimp, and the Whale-louse, *Cyamus*. From the Isopods the Amphipods differ in having pairs of limbs set both-ways, to the front and to the rear. Amongst them are the Sand-hoppers, *Talitrus*, which occur in millions near the water's edge on sandy coasts, incessantly leaping as if overflowing with the joy of life (PALEY). The Coast-screw, *Gammarus*; the xylophagous *Chelura*; and the tube-inhabiting *Cerapus*. Estimated number of species: British, 110.

Division PODOPHTHALMATA. ποὺς, a foot; ὀφθαλμὸς, an eye. Eyes on footstalks; body protected by a carapace.

Group 166.—Order STOMAPODA. στόμα, a mouth; ποὺς, a foot. Gills external; pairs of legs, generally seven. The Opossum-shrimps, *Mysis*, so called from the pouch in which the female carries her eggs, abound in some parts of the Arctic Seas. On the coast of Boothia they form the food of prodigious shoals of salmon: in the Greenland Seas two species form part of the food of the common whale. *Mysis Oberon*, found on the coast of Cornwall, is so transparent that in a tumbler of water nothing of it can readily be seen but its pair of black

eyes. The *Squilla*, or Mantis-shrimp, so called from its resemblance to an Orthopterous insect, exhibits most of the body segments with their appendages perhaps better than any other Crustacean. The larger species are tropical, and it is probable that the animal, like the Mantis, waits the approach of its prey within the reach of its truly formidable fore-legs. Estimated number of species: recent, 50 (M. EDWARDS); British, 18.

Order DECAPODA. δέκα, ten; πούς, a foot. Gills contained in cavities at the sides of the carapace. Pairs of feet, five, the first pair at least chelate, i. e. terminated by nipping claws. Includes Shrimps, Prawns, Lobsters, and Crabs.

Many of the finest examples were obtained from W. HARPER PEASE, by whom they were collected in the Pacific.

Tribe MACROURA. μακρός, long; οὐρά, a tail. That which is commonly called the tail is in reality made up of segments of the abdomen, which in the present tribe is terminated by a fan-shaped swimming appendage or fin, obviously acting to the greatest advantage when, by its powerful down-stroke, it propels the animal backwards.

Group 167.—Family PALÆMONIDÆ. Prawns, *Palæmon*, differ from Shrimps in the position of the segments bearing the antennæ, and in the carapace, which in the Prawn is generally keeled and extended in the form of a sharply-toothed beak, but in the Shrimp is depressed and unarmed. Prawns whilst living are objects of great beauty, and in warm climates often exhibit vivid colours and attain a large size. Mr. Gosse notices the curious fact that Prawns taken from the obscurity of deep holes

and rocky pools reflect a rich flush of iridescent purple extending over the whole body, heightening in effect the various streaks and spots of orange, light-blue, red, chestnut, and cream-white which adorn the animal. These disappear, though the animal may continue in health, after a few hours' exposure to the light; and specimens captured from shallow pools have even when first taken all their markings of a pale-olive tint. Estimated number of species, 42 (M. EDWARDS); British, 11 (BELL).

¶ Examples of *Rhynchocinetes*, *Hippolyte*, and *Palæmon*, including *P. carcinus* and *P. Jamaicensis*.

Group 168.—Families CRANGONIDÆ, ALPHEIDÆ, and PENÆIDÆ. Shrimps, *Crangon*, exhibit a tendency the reverse of that noticed in Prawns, the species found in Northern Seas being frequently larger than those belonging to the more southern coasts of Britain. In the Arctic seas and in the bays of Spitzbergen they supply food to the Walrus and the Seal (ADAM WHITE). Estimated number of species: recent, 52; British, 10 (BELL).

¶ Examples of *Crangon*, *Atya*, *Sicyonia*, *Alpheus*, including *Crangon borealis*.

This group, together with the preceding = Famille des SALICOQUES (M. EDWARDS).

Fifteenth Table Case.

The Mark ¶ indicates specimens or other illustrations exhibited in the Cases.

Group 169.—Families THALASSINIDÆ and ASTACIDÆ, excluding *Homarus*. The former of these families includes the burrowing MACROURA, generally found buried

in sand or mud: the body is long and weak and the shell or crust membranaceous. Some of the exotic species have the power of occasionally leaving the water and remaining out of it for a considerable time.

Astacus, the River Cray-fish, is found in fresh-water streams, especially near old bridges, where cracks in the masonry afford it a safe retreat.

Nephrops, the Norway Lobster, is generally a northern species, though Mr. BELL mentions having received fine specimens from the Mediterranean.

Estimated number of species: recent, 24; British, 7.

Group 170.—Genus HOMARUS (M. EDWARDS). Lobster.

The CRUSTACEA all cast their shells annually, or more frequently, until they arrive at full growth. In the presence of the gigantic variety of the common Lobster, *Homarus vulgaris*, found on the coasts of North America, it seems impossible that the huge mass of muscular flesh contained in the large claws should be withdrawn through the narrow joints without being crushed and destroyed. REAUMUR states that the segments are composed of two longitudinal pieces which open to allow of the withdrawal of the soft limb, and afterwards close again so accurately that it is very difficult in the cast crust to discover the line of division. This explanation, derived from observations on the River Cray-fish, has not met with general acceptance, and the method of the moulting, *ecdysis*, of the higher Crustacea is still open to discussion.

Estimated number of species: recent, 3 (M. EDWARDS); British, 1.

¶ Example of common Lobster, and of the gigantic American variety.

Group 171.—Family PALINURIDÆ. The Spiny Lobsters are undoubtedly amongst the most handsome of the *Macroura*; but the group is chiefly interesting from the fact that the Glassy-Crabs, *Phyllosoma*, till recently supposed to be included in the STOMAPODA, are now recognised as larval forms of the *Palinuridæ*. In *Astacus* and *Homarus*, the young, from the time when they are very small, are said closely to resemble the adult. If this be true, the affinity between the Lobsters and the Spiny Lobsters is probably simply a morphological one, and points of great interest may be expected to occur during future investigations of the physiological character of the Spiny Lobsters. The species are widely distributed, and are found on rocky coasts.

Estimated number of species: recent, 13; British, 1.

¶ Examples of *P. guttatus*, *P. Lalandii*, *P. longimanus*, &c., and of *Phyllosoma*.

Group 172.—Families SCYLLARIDÆ and GALATHEIDÆ.

The Broad-lobsters, *Scyllaridæ*, derive much of the peculiarity of their form from an extraordinary modification of the outer pair of antennæ, which in this family are developed into broad flat plates, sometimes strongly toothed on the margin and probably serving for shovels in excavating holes in the sea-bottom, in which the animals take shelter whilst watching for their prey.

The Plated-lobsters, *Galatheidæ*, resemble the preceding in habit. Mr. COUCH observes, with reference to *Galathea strigosa*, "It is very remarkable to witness the accuracy with which they will dart backward for several feet into a hole very little larger than themselves; this I have often seen them do, and always with precision."

The arrangement of M. EDWARDS is followed in the retention of *Galatheidæ* in the tribe MACROURA.

Estimated number of species: recent, 18; British, 5.

¶ Examples of *Scyllarus*, *Ibacus*, and *Galathea*; and of *Æglea lævis*, a fresh-water species from Chili, collected and presented by Capt. J. A. PERRY.

Tribe ANOMOURA. *ἀνομος*, irregular; *οὐρά*, a tail. The CRUSTACEA of this tribe exhibit an advance in organisation, the anterior or cephalo-thoracic portion of the body being more developed in comparison with the abdominal portion than in the MACROURA.

Group 173.—Section ANOMOURA INFERIORA (DANA) in part.

Sub-tribe PAGURIDEA. Hermit-Crabs.

In the Soldier-crabs, or Hermit-crabs, the abdomen is long, weak, and tender; it is therefore inserted into the cavity of some cast-off marine shell, of which the crab becomes the tenant, changing however its habitation for a more commodious one as it increases in size. Shells occupied by *P. Prideauxii*, a British species, very frequently afford a resting place for the Sea Anemone, *Adamsia maculata*. Within the shell, together with the crab, a beautiful sea-worm, *Nereis bilineata*, often resides, seizing and devouring without molestation a share of the food captured by the crab.

The Purse-crab, *Birgus latro*, inhabits many islands in the Pacific, living in holes at the roots of trees, and only occasionally visiting the sea. It feeds on the nuts of various palms, and is said to climb the cocoa-nut trees in search of its favourite food.

Estimated number of species: recent, 48; British, 10.

¶ Examples of *Cenobita*, *Calcinus*, &c.

Group 174.—ANOMOURA SUB-MEDIA. DANA.

Sub-tribe LITHODEA. Stone-crabs.

Not more than about six species are known belonging to this group.

¶ The Northern Stone-crab, *Lithodes Maia*, is found occasionally on the coasts of Scotland and the Isle of Man. The colour whilst the animal is living is yellowish red; that of an allied species from Fuegia is cherry-red. The Porcupine Stone-crab, *Lithodes hystrix*, is from Japan. The Noduled Stone-crab, *Echinocerus cibarius*, is from the Columbia River. It is probable that all the species are weak slow-moving animals, and that their strange aspect corresponds in some way with their more than ordinary need of protection.

Group 175.—ANOMOURA MEDIA. DANA.

Sub-tribe PORCELLANIDEA. Porcelain-crabs.

The little Porcelain-crabs are the butterflies of the class. Many species frequent coral reefs and as described and figured by D'ORBIGNY and other writers exhibit elaborate ornamentation and vivid colouring. One species is wholly of a bright scarlet-lake, another of a deep mazarin-blue, a third is rose-colour, with bands of snow-white fringe crossing the carapace; other more sombre species, including the "Broad-claw" of our own coasts, have series of long and delicate *lashes*, serving as nets or strainers for the capture of animalcules. The Hippidea are small Crustaceans found chiefly in the Pacific.

Estimated number of species: recent, 84; British, 2.

¶ Examples of *Porcellana*, *Remipes*, *Albunea*, &c.

Group 176.—ANOMOURA SUPERIORA. DANA. Several species of *Dromia* carry on the carapace a sponge-like mass of sufficient size to conceal the whole animal. M. EDWARDS remarks, that the *Dromia* fixes the load on its back by the aid of its posterior pair of legs. Some other crabs have similar habits, in consequence of which the older individuals resemble walking gardens of various kinds of Zoophytes. Mr. T. HIGGIN observed in the young of *Hyas coarctatus* that its bristles were sharply recurved at the point, forming a forest of hooks capable of entangling loose sprays of Zoophytes and Sponges, some of which would take root and at length form a thicket, under cover of which the robber crab might readily make a prey of unwary intruders.

Estimated number of species: recent, 12; British, 1.

¶ Examples of *Dromia*, *Dynomene*, *Homola*, *Ranina*, &c.

Tribe BRACHYURA. *βραχὺς*, short; *οὐρά*, a tail.

This tribe includes all the most highly organised Crustaceans. The nervous system is much more concentrated forwards than in the inferior tribes. The abdomen is slightly developed, and is not used to assist the animal in swimming. The larval form, *Zoea*, long considered to be a distinct animal, bears some resemblance to the adult type in the MACROURA.

Section A.—Crabs with mouths much narrowed in front =
Famille des OXYSTOMES (MILNE EDWARDS).

Group 177.—Families LEUCOSIDÆ, CORYSTIDÆ, and DORIPPIDÆ.

Many of the *Leucosidæ* are readily distinguished by their convex form narrowed in front into a kind of

muzzle, and by their porcellaneous shells smooth or granulated. They are tardy animals resting with their bodies covered up to the eyes in sand, often in deep water.

The *Corystidæ* are placed by DANA considerably higher in the series. The external antennæ are long and hairy. One species of *Corystes* inhabits British seas, and is called the Masked-crab.

Dorippidæ. The two posterior pairs of legs in these degraded-looking crabs are situated on the hinder part of the back, and are adapted for clasping.

Estimated number of species: recent, 60; British, 6.

¶ Examples of *Peltarion*, *Pseudo-corystes*, *Persephona*, *Ilia*, *Ixa*, &c.

Group 178.—Family CALAPPIDÆ. Nearly every species in this limited group is distinguished by striking peculiarities in form or colouring; but very little seems to be known of the life history of any one of them. The Mediterranean representatives of *Calappa* are called by the French *Crabes Honteux*, Modest-crabs, from their habit of hiding their heads and smaller limbs behind their broad-crested nippers, *chelæ*. The armour is certainly strong and very complete, and might be of invaluable service to the wearer if a *Calappa* had nothing to do but to defend itself from the attacks of enemies; but how a panoply allowing the limbs but little play can be convenient for the general requirements of crab-life has yet to be discovered, and perhaps may be by the aid of an aquarium.

Estimated number of species: recent, 18.

¶ Examples of *Matuta*, *Hepatus*, *Camara*, *Orithya mamillaris*, &c.

Section B.—*Crabs with quadrilateral shields* = Famille
des CATOMETOPES (MILNE EDWARDS).

Group 179.—Family GRAPSIDÆ. This family includes seven genera, the species of which are widely distributed through tropical and sub-tropical regions: they frequent coasts and rocks washed by the spray of the ocean, and are very timid creatures, retreating on the first alarm with great speed to their lurking places. *Nautilograpsus* alone is oceanic in its habits, and is found on floating timber or sea-weeds, often far from land.

Estimated number of species: recent, 60; British, 1.

¶ Examples of *Goniopsis*, *Sesarma*, *Trichopus*, *Plagusia*, &c.

Group 180.—Families OCYPODIDÆ and GONOPLACIDÆ.

The Ocypodians, as the name implies, are very swift runners, being nearly always on the strand where they dig holes in which for the most part they remain during the day, coming forth to feed at night. They are said to hibernate in holes further from the sea. The species of *Gelasimus* are remarkable for the enormous size of the claw on one side of the male crab: they live together in pairs in holes on the beach: the large chelæ are used to defend the entrance to the hole.* The Gonoplacians are good swimmers, and are generally found

* My friend, Canon KINGSLEY, describes the demeanour of this Crab as irresistibly ludicrous: "One of his claw arms, generally the left, has dwindled to a mere nothing and is not seen; while along the whole front of his shell lies folded one mighty arm on which he trusts; and with that arm, when danger appears he beckons the enemy to come on, with such wild defiance that he has gained therefrom the name of *Gelasimus vocans*, 'The Calling Laughable': and it were well if all scientific names were as well fitted." ("At Last," vol. ii., p. 89.")

in moderately deep water. The species are not well defined: one of the forms occurs in British seas.

Estimated number of species: recent, 82; British, 1.

¶ Examples of *Curtonotus*, *Macrophthalmus*, &c.

Sixteenth Table Case.

The Mark ¶ indicates specimens or other illustrations exhibited in the Cases.

Group 181.—Family GECARCINIDÆ and allies.

This group includes four families, well distinguished by the habits as also by the structure of the animals.

The *Thelphusidæ* are fresh-water crabs, living in holes on the banks of rivers.

The *Gecarcinidæ*, as the name implies, are Land-crabs, inhabiting the warmer regions of all parts of the world, except the interior of continents. Their gills are adapted for respiration so long as they are kept moist, a condition favoured by the nocturnal habits of the animals. Once in the year, at the spawning season, they are said to migrate in vast numbers together, always taking the nearest way to the sea.

The *Pinnotheridæ*, or Pea-crabs, reside in the bivalve shells of living Molluscs.

The *Mycteridæ* for the most part inhabit salt-marshes.

Estimated number of species: recent, 50; British, 2.

¶ Examples illustrating the four families.

Section C.—*Crabs with shields more or less semicircular in front* = Famille des CYCLOMETOPES (MILNE EDWARDS).

Family PORTUNIDÆ. Crabs with hinder tarsi much dilated, for swimming.

Group 182.—Genus CHARYBDIS (DE HAAN) and allies.

In the large division of the Crustacea characterised by having organs of vision set on long footstalks, *Podophthalmus vigil*, in this group, an inhabitant of tropical seas, affords the most striking example of pedunculated eyes, the special advantage of which to the animal has not been fully ascertained; but it seems certain that by such an arrangement the animal might compute the distances of objects of prey very accurately by their parallax, and might view them stereoscopically before devouring them.

Estimated number of species: recent, 20; British, 0.

¶ Examples of *Thalamita*, *Lissocarcinus*, &c.

Group 183.—Genus NEPTUNUS (DE HAAN) and allies.

Many of the species of this group are found on the high seas far from land. Note the clean-cut lines of the shield, the arms, and the swimming paddles in the frigate-like *Neptunus pelagicus*. The form of this ocean-crab is a study in the art of combining prehensile efficiency with strength and speed.

Estimated number of species: recent, 20; British, 0.

¶ Examples of *Amphitrite*, *Oceanus crucifer*, &c.

Group 184.—Genus PORTUNUS (FABRICIUS) and allies.

The British Swimming-crabs are known to fishermen by various local names, such as the common Shore-crab, the Velvet-crab, the Fiddler-crab, the Nipper, &c. They

are not first-rate swimmers, but are active and voracious, and from their omnivorous propensities have been termed the scavengers of the sea.

Estimated number of species : recent, 80 ; British, 12.

¶ Examples of *Scylla*, *Polybius*, *Portumnus*, &c.

Group 185.—Family ERIPHIDÆ (DANA).

Mr. DANA has established this family to include certain crabs distinguished by some important peculiarities connected with the respiratory apparatus. The small but pretty species of *Trapezia*, with bright porcelainous shields, are found amongst the branches and folia of living corals.

Estimated number of species : recent, 60 ; British, 2.

¶ Examples of *Eudora*, *Pilumnus*, *Galene*, *Domætia*, *Geryon tridens*, &c.

Family CANCERIDÆ.

Group 186.—Genus CANCER (LINNÆUS). The generic name *Cancer* has been retained to include the common edible crab, *Cancer pagurus*, and its allies. Several of the species grow to a large size. The gills of crabs are attached to the bases of the legs, and are contained in cavities protected by the sides of the carapace. An apparatus of fan-like appendages sweeps the water out of the gill-cavities by orifices in front, *efferent canals*, whilst a fresh supply of water rushes in from behind through orifices near the base of the fourth pair of legs, *afferent canals*, thus keeping up a constant circulation.

Estimated number of species : recent, 10 ; British, 1.

¶ Examples of about 6 species.

Group 187.—Genus XANTHO (LEACH) and allies.

¶ *Menippe gigas* (M. EDWARDS) is probably the most powerful Crustacean: the pincers are worked by a muscular apparatus enormously developed, and must be capable of crushing with ease the shells of many bivalve Mollusca. Much variety in colour and sculpture is met with amongst the smaller generic forms.

Estimated number of species: recent, 50; British, 2.

¶ Examples of *Chlorodius*, *Etisus*, *Daira*, *Actæodes*, &c.

Group 188.—Genus CARPILIUS (LEACH) and allies.

Estimated number of species, 24; British, 0.

¶ *C. coralinus*, *C. maculatus*, and the rare *C. signatus* afford good examples of the smooth, convex, and highly-coloured shields which prevail in this group; *Atergatis*, *Zozymus*, &c.

Section D.—*Crabs with shields more or less triangular, much narrowed in front* = Famille des OXYRHINQUÉES (MILNE EDWARDS).

Group 189.—Family PARTHENOPIDÆ. The species all live amongst rocks in moderately deep water; they move slowly and notwithstanding their grotesquely rugged aspect cannot be formidable except to animals much inferior in size to themselves. The single British species, the Strawberry-crab, is said to use its long arms in climbing.

Estimated number of species, 20; British, 1.

Family MAIADÆ.

Group 190.—Genus MAIA (LAMARCK) and allies.

Estimated number of species, 40 ; British, 1.

¶ *Maia squinado*, the Thorn-back-crab, is not uncommon on the British coasts and in the Mediterranean. It was well known by the ancients, and was regarded by them as an emblem of wisdom.

Group 191.—Genus MITHRAX (LEACH) and allies.

Estimated number of species, 40 ; British, 4.

Groups 190 and 191 constitute the family MAIADÆ ; most of the species in 191 have eyes on moveable foot-stalks, capable of being folded back and hidden in the channel of the orbit.

¶ Examples of *Pisa*, *Hyas*, &c.

Group 192.—Family INACHIDÆ. Spider-crabs.

Estimated number of species, 40 ; British, 6.

¶ *Leptopodia sagittaria* is remarkable for the extreme length and slenderness of its rostrum and limbs. Such a form could exist only in a medium of nearly its own specific gravity. A closely allied species is the colossal *Macrocheira Kaempferi* of Japan, having by far the greatest span of any Crustacean. (See case over the east door.) Examples of *Stenorhynchus*, *Eurypodius*, and other genera.

Seventeenth Table Case.

The Mark ¶ indicates specimens or other illustrations exhibited in the Cases.

As far as the end of the Eleventh Table Case, and in the following portion of the series, the tablets have been completed; and from them occasionally a paragraph has been inserted in this Synopsis, but sparingly, to avoid unnecessary bulk.

Group 198.—Class MYRIAPODA. μυριάς, 10,000; πούς, a foot. The animals of this class have comparatively few segments when first hatched. The head is distinct, and in the Centipedes is armed with poisonous fangs. The remainder of the body is made up of nearly similar segments. Respiration is by tracheæ.

I. Order CHILOPODA. χείλος, a lip; πούς, a foot. Centipedes: animals active, nocturnal, predacious.

II. Order CHILOGNATHA. χείλος, a lip; γνάθος, a jaw. Millipedes: animals tardy, vegetable feeders. About 500 species in this class are recognised by WALCKENAER.

¶ Examples of *Scolopendra gigantea*, *Lithobius*, *Geophilus*, *Julus*, *Polydesmus*, &c. Small series of British MYRIAPODA, collected and presented by H. H. H. *Euphorberia Brownii*, a fossil of the Middle Coal-Measures, collected at Ravenhead, and presented by H. H. H.

Class ARACHNIDA. ἀράχνη, a spider.

The following characters may serve to distinguish the animals of this class. Head and thorax amalgamated to form a cephalo-thorax; antennæ none, or modified into nippers; legs never more than four pairs; respiration aerial; transformations none, or indistinct.

The authorities most used have been C. L. KOCH and Dr. C. W. HAHN, "*Die Arachniden*," 16 vols. 8vo., and "*Histoire Naturelle des Insectes Apteres*," par M. le Baron WALCKENAER et M. PAUL GÉRAIS, 5 vols. 8vo., Paris, 1847.

Group 194.—Sub-class ARACHNIDA-TRACHEARIA.

Respiration by the skin or by respiratory tubes, *tracheæ*.

I. Order Podosomata. The Sea-spiders are found on Fuci, or under stones near low-water mark on the sea-coast, and are tardy creatures apparently made up grotesquely of little more than jointed limbs. *Pycnogonum*, *Nymphon*, &c.

II. Order Acarina. Water-bears, *Tardigrada*, animalcules found in wet moss, &c.; Mites, *Acari*; Water-mites, *Hydrachnidæ*; the Itch-acarus, *Sarcoptes*; the harmless parasite on the face, *Desmodex*; and the Ticks, *Ixodes*.

III. Order Adelarthrosomata. ἄδηλος, concealed; ἄρθρον, a joint; σῶμα, a body. Harvest-spiders, *Phalangidæ*; the Book-scorpion, *Chelifer*; and the venomous *Galeodes* of the family *Solpugidæ*.

The biology of this group, of which WALCKENAER describes about 450 species, when it shall have been fully investigated must prove to be deeply interesting, because of the extreme divergency amongst its con-

stituents. If the segregation be natural, *i. e.* if the genealogical affinity be real and close, great indeed must have been the influence of habits and circumstances under which a *Galeodes* and a *Desmodex*, a *Hydrachna*, a *Chelifer* and a *Pycnogonum* have been evolved from a common and not very remote ancestor.

Sub-Class ARACHNIDA-PULMONARIA.

Respiration by pulmonary sacs, with or without respiratory tubes; cephalothorax more or less distinct from the abdomen; eyes six, eight, or twelve in number.

Group 195.—Order PEDIPALPI. Scorpions and allies. Head and thorax amalgamated; abdomen distinctly segmented. Estimated number of species, 93 (WALCKENAER).

¶ Examples of about 22 species of Scorpions, including the Black or Rock-scorpion of Africa, the most formidable of the family. Several species of *Phrynus*: observe in the largest example, which is probably of an undescribed species, the extreme length and slenderness of the many-jointed tarsi of the first pair of legs. Examples of *Thelyphonus*, a hateful-looking but probably not venomous animal, of which species are found in Mexico, Brazil, India, Java, and other hot countries.

Group 196.—Order ARANEIDA. Spiders. Head and thorax amalgamated; abdomen not segmented; eyes six or generally eight. The life history of spiders is deeply interesting; that of the British species has been well told by Mr. E. F. STAVELEY.

Space is here deficient, but some of the more remarkable forms are exhibited, including *Gasteracantha* and *Acrosoma*, with bodies armed with long spines and glittering during life with brilliant metallic colours. Estimated number of species, 1220 (WALCKENAER); British, 803 (BLACKWALL).

¶ Small series of British Spiders presented by J. BLACKWALL, F. L. S., author of "*A History of the Spiders of Great Britain and Ireland.*"

Upper Compartment.

About 14 species of *Mygale*, μυγαλῆ, a Field-mouse; tubular nests of *Mygale*, shewing the trap-door; female *Mygale*, with egg-cocoon, &c.

Class INSECTA.

Head, thorax, and abdomen distinct; antennæ a single pair; three pairs of legs borne on the thorax.

The species included in this wondrous class have been estimated at 160,000 in number, which is about equivalent to the sum of the species in the whole of the rest of the Invertebrate Animals, together with the Fishes, Reptiles and Amphibians, Birds and Mammalia, with all the known species of plants in addition. In other words, Insects constitute about one-half of the species included in the Animal and Vegetable Kingdoms. (Mr. BENTHAM's *Presidential Address to the Members of the LINNÆAN SOCIETY*, 1871.)

The chief orders of the class have long been pretty well established on characters mainly derived from the organs of flight; but all attempts to collect the orders into higher divisions have hitherto been unsatisfactory. By far the most important scheme divides the class into

three sub-classes. I. AMETABOLA; Transformations absent. II. HEMIMETABOLA; Transformations incomplete. III. METABOLA; Transformations complete. But the advantage of this classification has in the present instance been relinquished as incompatible with the integrity of the Orders. Objectionable on the same ground are the older divisions: I. HAUSTELLATA; Insects with sucking mouths. II. MANDIBULATA; Insects with biting jaws. Groups 197–222 chiefly illustrate the former, groups 223–240 the latter of these divisions.

The order of the groups corresponds nearly with the arrangement adopted in the "*Introduction to the Modern Classification of Insects*," by J. O. WESTWOOD, F. L. S., 2 vols. 8vo., 1839; one of the best books on a subject of natural history that has ever appeared in the English or in any other language.

After some labour and much thought, the writer can only come to the conclusion that the disadvantages of a linear arrangement are nowhere more troublesome than amongst the manifold affinities in this most instructive class, INSECTA.

Order HETEROPTERA. ἕτερος, different; πτερον, a wing. Insects having their fore-wings chitinous or leathery towards the base, and membranous towards the apex. Estimated number of species: total, 1350 (F. WALKER, 1873); British, 354 (J. W. DOUGLAS).

Group 197.—HETEROPTERA—HYDROCORISA. ὕδωρ, water; κόρις, a bug.

This portion of the HETEROPTERA is made up of aquatic insects of which the species are not numerous.

¶ Examples of Water-scorpions, *Nepa* ; Boat-flies, *Notonecta* ; and of the only truly oceanic genus of insects, *Halobates*, specimens presented by Capt. BORLASE. Observe the arrangement of the eggs on the back of *Zaitha* ; how were they placed there ?

Small series of British species collected and presented by H. H. H.

The division AMETABOLA here introduced, consisting of insects which undergo no transformations, includes three orders of which the species are all of small size :

I. Order ANOPLURA. Lice, with sucking mouths. *Pediculidæ*.

II. Order MALLOPHAGA. Bird-lice, with biting jaws. *Philoptera*, several species of which are said to be found on the same animal.

III. Order THYSANURA. Spring-tails, *Podura*, *Lepisma*.

WALCKENAER describes 800 species of the first two orders, and 106 of the third. The British species of the first two orders have been described by H. DENNY ; those of the last have appeared very recently in a beautiful monograph by Sir JOHN LUBBOCK.

Group 198.—HETEROPTERA—GEOCORISA. γῆ, the earth ; κόρις, a bug. Notwithstanding the bad reputation attached to this group by reason of its including the common House-bug and some exotic species far more severely noxious, we here meet with curiously fantastic shapes and brilliant contrasts of colour. The British species though small are frequently beautiful, and have been described in an excellent monograph by J. W. DOUGLAS.

¶ Observe the foliaceous expansions on the legs of *Diactor*, the protective mimicry in *Phloea*, and the prismatic reflexions in some of the *Scutelleridæ*.

Small series of British species presented by J. W. DOUGLAS.

Order HOMOPTERA. ὁµὸς, like; πτερον, a wing. Wings four, entirely membranous and deflexed.

Group 199.—Family FULGORIDÆ. *Fulgor*, brightness; and allies.

¶ Examples: Lantern-flies, *Fulgoridæ*; the China Wax-insect, *Flata*; Frog-hoppers or Cuckoo-spit-insects, *Cercopidæ*; Plant-lice, *Aphidæ*; Scale-insects, *Coccidæ*; Cochineal-insect, *Coccus cacti*; Shell-lac-insect, *Coccus lacca*.

Observe the curious modifications of the "Lantern"; the waxen plumes in *Lystra*; the extravagant development of the prothorax in some of the exotic *Cercopidæ*.

Small series of British species presented by F. W. DOUGLAS.

Group 200.—Family CICADIDÆ. κικιάβη, the Screech-owl, in allusion to its shrill note. Illustrated by about 36 species, including representations of *Polyneura*, *Gæana*, and *Dundubia imperatoria*, the largest species in the group. Observe the instrument by which the male *Cicada* emits its loud note; it is a tense membrane on its sides near the base of its wings, and is best seen in *C. saccata*, from Australia.

A single species is found in Britain, where it is by no means common.

Group 201.—Order DIPTERA. δις, twice; πτερον, a wing.

Wings two; the lower pair of wings are replaced by a pair of slender filaments clubbed at the tip, called halteres or poisers. No two-winged fly has a sting.

Estimated number of species, 24,000 (BENTHAM); 5220 species are described in “*Histoire Naturelle des Insectes Diptères*,” J. MACQUART, 11 vols., 1835–1855. The British species exceed 2000; *Insecta Britannica, Diptera*, F. WALKER, 3 vols., 1856.

¶ Examples: Meat-flies, *Muscidæ*; Gnats and Mosquitoes, *Culicidæ*; Long-legs, *Tipulidæ*; House-flies, *Anthomyia*; Hoverers, *Syrphidæ*; Gad-flies, *Tabanidæ*. The African Tsetze, *Glossina morsitans*, is a desideratum.

Fleas, *Pulicidæ*, are inserted in this group because of their resemblance to certain two-winged flies found near the roots of trees in woods, *Mycetophilidæ*, the larvæ of which infest various species of *Agaricus* and other Fungi.

Observe the eyes in *Diopsis* set at the ends of foot-stalks; the hymenopterous aspect of *Mydas giganteus* and the extended proboscis of *Pangonia*, capable it is said of piercing the hide of cattle while the insect is still on the wing.

Series of British species presented by BENJAMIN COOKE.

Order LEPIDOPTERA. λεπίς, a scale; πτερον, a wing. Wings four, covered on both sides with minute imbricated scales. Estimated number of species, 24,000 (BENTHAM).

The works used in naming and arranging the series were numerous. Those of especial service were

"*Papillons Exotiques*," CRAMER AND STOLL, 5 vols. 4to. ; "*Sammlung Europæischer Schmetterlinge*," J. HÜBNER, 9 vols. 4to. ; "*Genera of diurnal Lepidoptera*," DOUBLEDAY AND WESTWOOD, 2 vols. imp. quarto ; and the works of W. C. HEWITSON.

Division HETEROCERA. *ἕτερος*, different ; *κέρας*, a horn. This division includes all the insects of the order except Butterflies.

Group 202.—MICRO-LEPIDOPTERA. *μικρός*, small. In this group are included all the *Heterocera* below the *Noctuæ* ; *Pyralidina*, *Tortricina*, *Tineina*, *Pterophorina*, and *Alucitina*. More than 800 species are described and figured by H. T. STANTON in his monograph of *Tineina*, 13 vols. 8vo. The British species representing the group exceed 1130 ; the exotic species are in proportion less numerous than in other groups.

Group 203.—NOCTUÆ-GENUINÆ. Estimated number of species : British, more than 300 ; European, 800.

¶ Examples of a few exotic and about 80 selected species of British Noctuæ. Observe the diversity elaborated within the limits of conspicuous similarity.

Group 204.—NOCTUÆ-LIMBATÆ. *limbus*, a border. Observe the British species of *Catocala*, including *C. Fraxini* ; also the Owl-moth of Brazil, *Thysania Agrippina*, so coloured as easily to escape notice when resting on the bole of a tree. The specimen exhibited measures more than eleven inches across the wings.

Eighteenth Table Case.

The Mark ¶ indicates specimens or other illustrations exhibited in the Cases.

Group 205.—GEOMETRINA. γῆ, the earth; μέτρον, a measure. The name alludes to the mode of progression adopted by the larvæ, which are called loopers because in moving they alternately take the form of the Greek letter Ω and extend themselves at full length.

The females of certain species are without wings. *Geometræ*, of which about 270 kinds inhabit Britain, are sometimes seen in the cold grey light of a winter evening, but more characteristically they are the butterflies of the summer twilight. Whilst the *Noctuæ* and other more robust moths, passing swiftly by, seem always in haste, these slender and delicately coloured insects flutter leisurely along the hedge-side in the gloaming, apparently in a condition of perfect enjoyment.

Upper Compartment.

Specimens of preserved larvæ, showing protective mimicry.

Section BOMBYCINA. βόμβυξ, the silk-worm.

Group 206.—Genus SATURNIA, and allies. This group includes amongst its constituents upwards of 40 silk-producing moths, the larvæ of which secrete the silk in two large intestine-like vessels which unite at the mouth in a common tube called the spinneret; through this tube is ejected the secretion which, as soon as it comes in contact with the air, hardens into a shining fibre known as silk.

Observe the configuration of the shaded pattern in *Brahmæa* and the talc-like spot in *Attacus-Atlas*.

Upper Compartment.

The Ailanthus Silk-moth, *Attacus Cynthia*, Cocoons, Silk, &c.; also Cocoons and Silk of the Tusseh and various other Silk-worms, presented by F. MOORE.

Group 207.—Genus ARCTIA and allies. Observe examples of the exotic genus *Histia* from Northern India and Java, the species of which in outline and colouring closely resemble butterflies. For an account of mimicry in Insects see the Tablet. The group is illustrated by 18 British species.

Group 208.—PSEUDO-BOMBYCES. The Swifts, Lappets, and Prominents, include some of the most rare and beautiful British moths. Of these about 40 species are exhibited.

Upper Compartment.

Specimens of a Fungus, *Torrubia Robertsi*, on the larvæ of *Hepialus* from New Zealand; also of *Torrubia militaris* on pupæ of moths, collected at Rainhill and presented by H. H. H. Prepared larvæ of moths.

Group 209.—Family URANIIDÆ and allies. Species of *Urania* are frequently seen near the rivers of Brazil flying in a certain direction, and following one another in rapid succession for several days together; yet not one is seen to return. These insects resemble butterflies, but are distinguished by the antennæ which are not clubbed, and by the chrysalis which is not angular. Observe especially the very rare and beautiful *Urania Riphæus*, a native of Madagascar, and the scarcely less beautiful *Nyctalemon*.

In this group also are included the Burnets, Clearwings, &c., *Zygænidæ* and other Families: amongst

them may be noted *Glaucopsis caudata*, with an appendage resembling an ovipositor; it is probably a mimic of an associated Hymenopterous insect.

Group 210.—Family SPHINGIDÆ. σφιγξ, the sphinx. The name alludes to the larva, which frequently carries its head erect. Note the artistic correspondence between the colour patterns and the very peculiar outlines of the insects in this group.

Upper Compartment.

Specimen of *S. Carolina*, with extended proboscis.

Division RHOPALOCERA. ῥόπαλον, a club; κέρας, a horn.

This division includes all the Butterflies, properly so called.

The colour patterns of Butterflies appear to be derived through various modifications from two very simple type patterns, wrought with one or both of two kinds of scales.

A. FIRST TYPE-PATTERN. Wings having a pale ground with lines composed of dark scales along the veins. Example: *Aporia cratægi*. British.

B. SECOND TYPE-PATTERN. Wings having a pale ground with an orange or red blush occupying the central area. *Gonepteryx Cleopatra* European.

There are also two kinds of scales :

C. SCALES COLOURED BY PIGMENT. White, Yellow Brown, Black, Red, &c.

D. IRIDESCENT SCALES, deriving their colour chiefly from the striation of their surface. Gold, Silver, Blue, Green, Amethyst, Crimson, &c.

Modifications :—

A'. Dark lines attenuated, visible only at the tip and there expanded. *Pieris Brassicæ*. British.

A''. Dark lines expanded, forming patches and scallops. *Arge Galathea*. British.

A'''. Dark lines expanded, forming a blackish area, and leaving the pale ground visible only in spots or markings. *Thymele alveolus*. British. *Lasiommata Aegeria*. British.

B'. Blush, occupying a space near the tip. *Anthocaris cardamines*. British.

B''. Blush, occupying nearly all the area of the wings.

Note.—Even where, as in *Euplœa Treitschkei*, only a small spot or two of white is shown on the wings, it is pretty plain that the ground colour of the wing is white, almost wholly obscured by a greater development of the dark scales belonging to the veins. The iridescent scales, except when forming metallic markings, as on the under side of the Fritillaries, are generally mingled with dark scales (rarely with the pale ground scales), the edges of the areas in which they prevail being shaded off, as in *Apatura Iris*. British.

The Common Admiral, *Pyrameis Atalanta*, is an example of the combination of A''' with B''. Wherever the black does not extend, is shewn the red blush, which does not however reach quite to the tip of the fore wing, for there, apertures in the black show the white or pale ground colour in spots. The New Zealand Admiral, *Pyrameis gonerilla*, on the under-side of the fore wing indicates plainly that the true character of the red area is that of a blush on a pale ground. The subject is more fully treated by the Writer in a paper which appeared in the *Quarterly Journal of Science*, for July, 1868, and has been honoured with a favourable notice by Mr. DARWIN (*Descent of Man*, vol. ii., p. 134, note).

Group 211.—Family HESPERIDÆ. Skippers. A rustic type of form and colouring characterises the insects of this group from all parts of the world. Estimated number of species : British, 7 ; exotic, 650.

Group 212.—Families ERYCINIDÆ, Humming-bird Butterflies ; and LYCÆNIDÆ, Coppers, Blues, Hair-streaks. The *Erycinidæ* are chiefly from Tropical America : amongst them are counterparts in miniature of most of the chief types amongst the Butterflies. Do these insects appreciate their own beauty ? It is a beauty distinguished not less by its superlative richness and variety than by the absence of all incongruous embellishments. Such an insect as *Helicopsis Cupido* is to an eye not æsthetically trained, what a *scherzo* of Beethoven's is to an unmusical ear. In approaching the question how such a result has been produced through evolution, the present case differs not in *kind* from that of any other living thing ; but the difficulties associated with the hypothesis of evolution, when regarded as working only by means of *natural selection*, are in such an instance as this conspicuously displayed.

Estimated number of species : British, 19 ; exotic, 750.

Group 213.—Family SATYRIDÆ and allies. Meadow-russet Butterflies. Note the transparent wings with one azure spot in *Hætera Esmeralda*. Estimated number of species : British, 11 ; exotic, 450.

Group 214.—Family MORPHIDÆ and allies. Glory of Brazil Butterflies. The typical kinds are all found in Tropical America : some species frequent open places in forests, flying with a slow flapping motion over the tops of the low herbage : others sail majestically round the tops of trees and are difficult to capture. Observe the resplen-

dent *Morpho Cypris* from Columbia, and the opaline sheen of *Morpho Ganymede* from Bogota. Estimated number of species, 100.

FAMILY NYMPHALIDÆ. νύμφη, a bride.

Group 215.—Genus APATURA and allies. The group includes Butterflies allied to the Purple Emperor found in Britain. Note especially *Nymphalis Jason*, from Southern Europe. Estimated number of species: British, 2; exotic, 400.

Upper Compartment.

¶ Examples of mimicry of leaves, *Kallima Inathis* and *Hebomoia Glaucippe*. Earlier and later broods of the same Butterfly, *P. prorsa* and *Levana*.

Group 216.—Genus VANESSA and allies. Note several exotic species corresponding with British forms, *e. g.* the New Zealand Admiral, *Pyrameis gonerilla*.

The caterpillar of a Butterfly is an embryo furnished with the means of locomotion and mastication. The stages which the bird passes through in the egg, and the animal in the foetus, are attended in the insect by the power of seeking for and devouring food.

Upper Compartment.

Preserved larvæ, and drawings of eggs.

Nineteenth Table Case.

Group 217.—Genus ARGYNNIS (FABRICIUS) and allies. FRITILLARIES. Note *Agraulis moneta*, Mexico, so called from the silver-like plates on its under side. Estimated number of species: exotic, 150; British, 9.

Group 218.—Family HELICONIDÆ and allies. The beautiful *Heliconidæ* are from Tropical America: when crushed they emit an offensive odour, which is said to protect them from the attacks of birds. The group

includes the *Acraeidae* from Africa. Estimated number of species: exotic, 350.

Group 219.—Family DANAIDÆ and allies. The species are natives of the Eastern Hemisphere. Note especially the two species of *Hestia* from Java. Estimated number of species: exotic, 110.

Upper Compartment.

Case with examples of the black-veined-white pattern from six distinct families of butterflies, and one of moths.

Group 220.—Family PIERIDÆ. Whites. Note the European and Mexican species allied to the Brimstone Butterfly of this country; also the mimicry of the *Heliconidae* in the females of certain species. Estimated number of species: exotic, 450; British, 10.

Upper Compartment.

Pairs of Butterflies shewing a remarkable difference between the male and female of the same species; preserved larvæ and magnified drawings of eggs.

Family PAPILIONIDÆ.

Group 221.—Genus PAPILIO and allies. Swallow-tailed Butterflies. For the Linnæan divisions of the Butterflies into *Equites*, *Danai*, *Plebeii*, &c., see the Tablet.

Upper Compartment.

Case with specimens of *Papilio Vertumnus*, presented by H. J. CAUTY. A chair is placed near, by the aid of which *P. Vertumnus* may be seen by looking down upon it from above; whence the carmine spot on the lower wing appears of a pale amethystine hue.

Group 222.—Genus ORNITHOPTERA, and allies. ὄρνις, a bird; πτερόν, a wing.

These royal insects are found chiefly in the Molucca Islands and in New Guinea. Observe the difference between the male and female in *O. Cræsus* and *O. Aruana*; also the extended palpi in *Teinopalpus*, a native of the higher ranges of the Himalayas, on the borders of Assam. Estimated number of species, 20.

Order NEUROPTERA. νεῦρον, a nerve; πτερόν, a wing.

Group 223.—NEUROPTERA in part.

¶ May-flies, *Ephemeridæ*; Ant-lions, *Myrmeleonidæ*; Lace-wings, Golden-eyes, *Hemerobiidæ*; two examples of the exquisitely fantastic forms characteristic of the genus *Nemoptera*, *N. Coa* and *N. Lusitanica*; *Corydalis*, the most savage looking of all insects; Winged, worker, and soldier forms of *Termitidæ*, the so-called White Ants. The group also includes the order TRICHOPTERA (KIRBY), = the Caddice-flies, *Phryganeidæ*, and the order THYSANOPTERA (HALIDAY) = *Thrips*. Series of British representatives of the group, presented by BENJAMIN COOKE. Wing of a large insect, beautifully preserved in a nodule of ironstone, from the middle coal-measures, Ravenhead; collected by the writer, and referred to the genus *Corydalis*. Mr. B. COOKE, after a careful examination of the fossil, believed it to represent the basal portion, about one-third only, of the fore-wing of a *Nothochrysa*.

Upper Compartment.

Larva of Ant-lion ; female of White Ant.

Group 224.—NEUROPTERA ODONATA. Dragon-flies,
Libellulidæ.

Note the extraordinary length of body in *Lestes*
Lucretia, from the Cape of Good Hope ; also
the species from Borneo. British series, B.
COOKE and F. BROCKHOLES.

Order ORTHOPTERA. ὀρθός, straight ; πτερόν, a wing.

Group 225.—Family PHASMIDÆ. φάσμα, a spectre.

Walking-stick and Spectre insects, vegetable feeders,
chiefly found in India, China, South America,
and Australia. Observe *Lonchodes virgeus*,
which has the longest span of any known
insect ; also three species of genus *Phyllium*,
the Walking-leaf.

Group 226.—Family MANTIDÆ. μάντις, a devotee.

Generally distributed in warm climates ; rapacious
insects, assuming, whilst on the watch for
prey, attitudes alluded to in the names *Mantis*
religiosa, *Mantis oratoria*, &c.

¶ About 24 species illustrate the group.

Group 227.—Family LOCUSTIDÆ. λόχος, a troop.

Tree-locusts. Rarely gregarious. Most of the
continental authorities agree in applying the
name "Locust" to the species in this group,
distinguished by their long, slender antennæ,
and by the sabre-like ovipositor of the female.
Either the Greek or the Latin derivation (*locus*
ustus, a scorched place) of the name would

seem to apply more appropriately to the gregarious and migratory species included in the following group.

Observe the closeness of the resemblance between several species of Locusts and the leaves of trees in various stages of decay. This mimetic perfection may be regarded as the result of progressive improvements on the part of the assailants, as well as on the side of the species protected by disguise; individuals on the one side becoming more and more mimetic, and on the other (that of their enemies) more and more able to penetrate through the assumed disguises.—(*The Naturalist in Nicaragua*, by THOMAS BELT, 1874.)

Group 228.—Family ACRIDIIDÆ. ἀκρίς, the grasshopper. Migratory Locusts, Grasshoppers, &c. The ravages for which these insects have long been notorious have not been confined to a single country; nor have they always been committed by the same kind of locust. Africa seems to have suffered most frequently and severely, but Europe, North and South America, and the East have from time to time been subject to their visitations.

Series of British species, presented by B. COOKE.

Twentieth Table Case.

The Mark ¶ indicates specimens or other illustrations exhibited in the Cases.

Group 229.—Families ACHETIDÆ and BLATTIDÆ. Crickets, *Achetidæ*. ἡχέρης, an utterer of shrill sounds.

Note the form of the fore-legs, constructed for burrowing, in the Mole-cricket, *Gryllotalpa vulgaris*.

Cockroaches, *Blattidæ*. The British species are of small size: the common Cockroach which infests houses, *Blatta Orientalis*, is supposed to have been introduced from the Levant.

The order EUPLEXOPTERA = Earwigs, *Forficulidæ*, derives its name from the wondrous manner in which the ample wings are folded and hidden under the tiny wing-sheaths of the insect.

The order STREPSIPTERA = Stylops, parasitic on Bees, closely allied to the Beetles, would be here illustrated, but the insect is yet a desideratum.

Order COLEOPTERA. *κολαδς*, a sheath; *πτερον*, a wing.

The number of species in this order, as estimated by Mr. BENTHAM in 1871 is 90,000. Works of especial service in naming and arranging the series were, LACORDAIRE, *Genera des Coléoptères*, 9 vols., Paris, 1859; OLIVIER, *Entomologie*, 6 vols. 4to.; GORY et PERCHERON, *Monographie des Cétoines*.

Most of the groups include a small series of selected British species presented by B. COOKE, or collected in the neighbourhood of Liverpool by H. LONGUET HIGGINS.

Group 230.—Divisions EUPODA, PSEUDOTRIMERA, HETEROMERA.

Examples of Tortoise-beetles, *Cassididæ*; Turnip-fly, *Phyllotreta*; Lady-birds, *Coccinellidæ*; Meal-worm-beetle, *Tenebrio*; Cellar-beetle, *Blaps*; Oil-beetle, *Meloë*; Blister-beetle, *Lytta*, &c.; also of the division BRACHELYTRA.

Estimated number of British species, more than 1,000.

Division LONGICORNES. Long-horned Beetles.

Group 231.—Families LAMIADÆ, LEPTURIDÆ, and allies. The group is illustrated by more than 60 exotic species, and by many of the 40 British species. Note the tufted horns in some examples of *Lamia*.

Upper Compartment.

Series of Long-horned Beetles, collected in Madagascar, and bequeathed to the Museum by W. T. GERRARD.

Group 232.—Families CERAMBYCIDÆ, PRIONIDÆ, &c. The Family *Cerambycidæ*, as established by LINNÆUS, included most of the Long-horned Beetles, now distributed in more than 1,300 genera. British representatives of the group, 12 species.

¶ *Psolidognathus Friendii*, from Columbia.

Group 233.—Division RHYNCOPHORA. ῥύγχος, a snout ; φέρω, I carry. Weevil-beetles. The space allotted to exotic forms is occupied by more than 80 species illustrating the principal types. British species, 500; exotic very numerous, distributed in about 900 genera.

Note the series of Diamond and Gold-patch Beetles, *Entimus*, *Cyphus*, *Eupholus*, &c.

Group 234.—Divisions STERNOXI and MALACODERMI. Examples of *Buprestidæ*, remarkable for their gorgeous colours; Skip-jacks and Fire-flies, *Elateridæ*, in certain species of which spots becoming luminous in the dark may be seen on the hinder angles of the thorax; the Glow-worm, *Lampyris*, &c. British species, 200.

Group 235.—Family CETONIIDÆ and allies. Goliath Beetles, Rose-chafers, Cock-chafers, &c. British

species, 15. The exotic species are very numerous; about 90 are exhibited.

¶ *Mycteristes Cumingii*, Philippines, and seven species of *Ceratorhina*, all from Africa.

Group 236.—Family SCARABÆIDÆ and allies. Specimens of the Sacred Scarabæus, *Ateuchus sacer*; Dumbledor, *Geotrupes*, &c. British species, 62.

Note the wondrous horn-like extensions of the thorax in *Chalcosoma Atlas*, and the prodigious forelegs in *Euchirus longimanus*.

Upper Compartment.

Ancient Egyptian Scarabæus.

Group 237.—Families LUCANIDÆ, DYTICIDÆ, and others. Carrion-beetles, *Necrophaga*; Stag-beetles, *Lucanidæ*; Predaceous Water-beetles, *Hydradeephaga*, &c. British species, 600.

¶ *Chiasognathus Grantii*, Chili, &c.

Group 238.—Division GEODEPHAGA. Predaceous Land-beetles. Tiger-beetles, *Cicindelidæ*; *Carabidæ*; Bombardier-beetle, *Brachinus crepitans*, &c. British species, 350.

¶ *Mormolyce Phyllodes*, Java; *Manticora scabra*, Africa, &c.

Order HYMENOPTERA. ὑμὴν, a membrane; πτερον, a wing.

The species of Hymenoptera have been estimated at 25,000, but no work has appeared on the whole of the order comparable with the great work of LACORDAIRE on the Coleoptera. In this country, collectors of Butterflies and of Beetles are more numerous by many times than collectors of the Hymenoptera; yet these, in their biology, are far more interesting than any other order of insects.

Group 239.—Divisions TEREBRANTIA and ACULEATA in part. Saw-flies, *Tenthredinæ*; Gall-flies, *Cynipidæ*; Ichneumons, Wasps, Hornets, &c.

More than 250 kinds of galls have been described, many of which are formed by *Cynipidæ* on the roots, twigs, or leaves of the oak. The minute particle of virus injected by the insect when depositing its egg seems to possess properties capable of compelling the growth-force of the oak to develop cells constructing an oak-apple, a nut-gall, a leaf-spangle, or some other form of *nidus* best adapted to the habits and necessities of the tiny parasite: a correlation truly wondrous. Galls are known to be injurious to oak-trees; can their presence be associated with some compensative advantage?

Note the enormous length of the ovipositor and sheath in *Pimpla atrata*. British series, chiefly local, deposited by the Royal Institution, Liverpool.

Upper Compartment.

Nests of Social Wasps; Galls and Oak-apples, with the Gall-fly *Cynips*, together with specimens of *Allantus* and *Chalcis*, from the same gall.

Group 240.—Family FORMICIDÆ and Division MELLIFERA. Ants and Bees. About 180 British species of Bees have been described.

Mr. BELT's work on Nicaragua contains a large amount of very interesting information on the habits of ants, especially those of a species of stinging ant which finds both food and a home

in the hollow thorns of an *Acacia*, and in return protects the tree from the formidable attacks of leaf-cutting ants. The *Ecitons*, or foraging ants, he regards as being in intelligence at the head of all the insect tribe.

¶ Male, Female, and Worker of the Hive Bee, British series of Bees, chiefly collected in the neighbourhood of Liverpool, by H. H. H., and deposited by the Liverpool Royal Institution.

SUPPLEMENTARY NOTE TO GROUP 11.

The following Extract is from an address delivered by my friend Professor ALLMAN, F.R.S., to the Biological section of the British Association, 1873.

“ Let us take an example in which these two principles seem to be illustrated. In rocks of the Silurian age there exist in great profusion the remarkable fossils known as Graptolites. These consist of a series of little cups or cells arranged along the sides of a common tube, and the whole fossil presents so close a resemblance to one of the Sertularian hydroids which inhabit the waters of our present seas as to justify the suspicion that the Graptolites constitute an ancient and long since extinct group of the Hydroida. It is not, however, with the proper cells, or hydrothecæ, of the Sertularians that the cells of the Graptolite most closely agree, but rather with the little receptacles which in certain Sertularinæ belonging to the family of the Plumularidæ we find associated with the hydrothecæ, and which are known as “nematophores.” A comparison of structure, then, shows that the Graptolite may, with considerable probability, be regarded as representing a Plumularia in which the hydrothecæ had never been developed, and in which their place had been taken by the nematophores.

“ Now it can be shown that the nematophores of the living Plumularidæ are filled with masses of protoplasm which have the power of throwing out pseudopodia, or long processes of their substance, and that

they thus resemble the Rhizopoda, whose soft parts consist entirely of a similar protoplasm, and which stand among the Protozoa, or lowest group of the animal kingdom. If we suppose the hydrothecæ suppressed in a Plumularian, we should thus nearly convert it into a colony of Rhizopoda, from which it would differ only in the somewhat higher morphological differentiation of its cœnosarc, or common living bond by which the individuals of the colony are organically connected. And just such a colony would, under this view, a Graptolite be, waiting only for the development of hydrothecæ to raise it into the condition of a Plumularian.

“Bringing, now, the Evolution hypothesis to bear upon the question, it would follow that the Graptolite may be viewed as an ancestral form of the Sertularian hydroids, a form having the most intimate relations with the Rhizopoda, that hydranths and hydrothecæ became developed in its descendants, and that the Rhizopodal Graptolite became thus converted in the lapse of ages into the hydroidal Sertularian.

“This hypothesis would be strengthened if we found it agreeing with the phenomena of individual development. Now such Plumularidæ as have been followed in their development from the egg to the adult state do actually present well-developed nematophores before they show a trace of hydrothecæ, thus passing in the course of their embryological development through the condition of a Graptolite, and recapitulating within a few days stages which it took incalculable ages to bring about in the palæontological development of the tribe.”

NOTE.

Six tiers of drawers occupy each side of the block supporting the table-case, and not four tiers as indicated by the frontispiece.

7

